GEK-35981

TermiNet*

CASSETTE ACCESSORY

(TCA)

SERVICE MANUAL

Electronic Services - Los Angeles
M14583X

MP MASTER
MA32649

GENERAL ELECTRIC

*Trademark, General Electric Company, USA

The information contained herein does not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company, USA.

© Copyright General Electric Company, USA 1974

TermiNet DATA COMMUNICATION PRODUCTS

TermiNet CASSETTE ACCESSORY (TCA)

SERVICE MANUAL - GEK-35981A

Printed January, 1975 (2000)

PREFACE

The instructions in this Service Manual are written assuming that all subassembly parts can be replaced in the field.

The tape deck motor speeds are set by adjusting potentiometers on the TUC and TMC Printed Circuit Boards. A special test tape is required to make these adjustments. When the tape deck, the TMC, or the TUC printed circuit board is replaced, the motor speeds must be readjusted using the test tape and a frequency counter.

The procedure for making the speed adjustments is presented under *ADJUSTMENTS* in Chapter V.

TABLE OF CONTENTS

PAGE

PREFACE ii

INDEX iv

CHAPTER I - INTRODUCTION I-1

CHAPTER II - UNPACKING, INSTALLATION AND CHECKOUT II-1

Section 1 - Unpacking and Installation II-1
Section 2 - Checkout Procedure II-6

CHAPTER III - PRINCIPLES OF OPERATION III-1

Section 1 - Operating Instructions III-1
Section 2 - Functional Description III-24

CHAPTER IV - TROUBLESHOOTING IV-1

Section 1 - Troubleshooting Guide IV-1
Section 2 - Drawings IV-6

CHAPTER V - MAINTENANCE V-1

Section 1 - Routine Maintenance V-1
Section 2 - Parts Removal and Replacement and Adjustments V-2

CHAPTER VI - PARTS VI-1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1-1	Magnetic Tape Cassette Accessory (TCA)	I-1
2-1	Removing TCA Cover	II-2
2-2	Packing Tape and Motor Cushion	II-2
2-3	Shipping Screw and Spacer	II-2
2-4	Mother Board Modification	II-4
3-1	How Data "Blocks" are "Written" on Tape	III-1
3-2	Opening the Cassette Door	III-2
3-3	Loading Cassette	III-3
3-4	Cassette Orientation	III-3
3-5	Closing the Cassette Door	III-3
3-6	Write Lockout Tab	III-3
3-7	TCA Pushbutton Operations	III-5
3-8	Functional Response Chart	III-22
3-9	Functional Flow Diagram of Write Sequence of Operation	III-26
3-10	Functional Flow Diagram of Read Sequence of Operation	III-27/III-28
4-1	TLP Printed Circuit Board - A1, A2, and A3 Models TCA	IV-8
4-2	TRP/1 Printed Circuit Board (44C420203-G01, Rev. 3) - A1 Model TCA	IV-9
4-3	TRP/2 Printed Circuit Board (44C420203-G02, Rev. 2) - A2 Model TCA	IV-10
4-4	TRP/3 Printed Circuit Board (44C401224-G03, Rev. 2) - A2 Model TCA	IV-11
4-5	TPS/1 Printed Circuit Board (44C420202, Rev. 11) - A1 Model TCA	IV-12
4-6	TPS/2 Printed Circuit Board - A2/A3 Models TCA	IV-13
4-7	TUC/1 Printed Circuit Board (44D420301, Rev. 8) - A1 Model TCA	IV-14
4-8	TUC/2 Printed Circuit Board - A2 and A3 Models TCA	IV-15
4-9	TMC/1 Printed Circuit Board (44C420201, Rev. 5) - A1 Model TCA	IV-16
4-10	TMC/2 Printed Circuit Board - A2 and A3 Models TCA	IV-17
4-11	TCA Deck/Preamp (44C400175, Rev. 1) - A1, A2, and A3 Models TCA	IV-18
4-12	Interconnection Diagram (44D420300, Sh. 1, Rev. 6) - A1 Model TCA	IV-19
4-13	Interconnection Diagram (44D420300, Sh. 3, Rev. 1) - A2/A3 Models TCA	IV-20
4-14	Interconnection Diagram - A1 Model TCA	IV-21
4-15	Interconnection Diagram - A2 and A3 Models TCA	IV-22
4-16	TCA Cable - A1, A2 and A3 Models TCA	IV-23
4-17	TCA Interconnection List	IV-24
5-1	Tape Head	V-1
5-2	Enclosure Screws	V-2
5-3	Pushbutton Switch/Indicator Removal	V-3
5-4	Tape Deck Removal	V-3
5-5	Tape Deck	V-6
5-6	Forward Motor Mount Retaining Screw	V-7
5-7	Forward Motor Solenoid	V-8
5-8	TLP PCB Removal	V-9
5-9	PCB Removal	V-10
5-10	Power Transformer and Reactors Removal	V-10

LIST OF ILLUSTRATIONS (CONTINUED)

FIGURE	TITLE	PAGE
5-11	Heat Sink Removal	V-11
5-12	Power Transistor Removal	V-11
5-13	Balance Pot on TMC PCB	V-12
5-14	TUC PCB	V-14
5-15	TMC PCB	V-14
6-1	Printed Circuit Boards and Connectors and Brackets	VI-3
6-2	TLP Printed Circuit Board and Fuses	VI-4
6-3	Power Transformer, Reactor, and Main Frame Harness	VI-4
6-4	Heat Sink and Transistors	VI-5
6-5	Tape Deck Assembly	VI-5
6-6	Chassis, Supports and Wire Harness	VI-5
6-7	TCA Enclosure	VI-5
6-8	Rubber Foot	VI-6
6-9	Interconnection Cable Assembly	VI-6
6-10	Power Cord and Plug	VI-6
6-11	TRP Printed Circuit Board	VI-6
6-12	Tape Cassette	VI-7/VI-8
6-13	Motors and Rubber Drive Wheel	VI-7/VI-8
6-14	Forward Motor Solenoid	VI-7/VI-8

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_08073

CHAPTER I

INTRODUCTION

GENERAL DESCRIPTION

The TermiNet Cassette Accessory (TCA) is an accessory to the TermiNet 300 and 1200 Printers (Figure 1-1). The TCA (Figure 1-1) can be used as an alternative to the punched paper tape equipment to store and retrieve data. The TCA stores data on magnetic tape: A Philips type cassette which contains certified computer-grade magnetic tape. The major advantages of the TCA over the punched paper tape equipment are that it is quiet, compact and the magnetic tape is reusable.

The TCA can operate at speeds of 110, 150, 300, and 1200 bits-per-second. The A3 (and A4) model TCA is specifically designed for use with the TermiNet 1200 Printer to utilize the higher print rate capacity of the TermiNet 1200 Printer as efficiently as possible.

The TCA is connected to the Printer with a multiconductor cable, which plugs into the rear of the Printer, and obtains power from its own power cord. The TCA is interfaced to the Printer with a Tape Record and Playback (TRP) printed circuit board, which also contains control circuits, and is located in the Printer's logic rack. The TRP board performs a similar function as the Reader and Punch (R&P) board for the punched paper tape equipment; however, the boards are not interchangeable because they utilize the same slot in the Printer logic rack.

TCA-4020

Figure 1-1. Magnetic Tape Cassette Accessory (TCA)

Therefore, the TCA and punched paper tape equipment cannot be connected to and simultaneously used with the same Printer.

MODEL NUMBER

The model number is shown on a label on the back of the TCA. The contents of this manual apply to the following models of the TCA.

3S3020AA000A1	(A1 model) Operates on nominal 117V AC.
3S3020AB000A1	(Export A1 model) Operates on nominal 230V AC.
3S3020AA000A2	(A2 model) Operates on nominal 117V AC.
3S3020AB000A2	(Export A2 model) Operates on nominal 230V AC.
3S3020AA000A3	(A3 model) Operates on nominal 117V AC. Used with TermiNet 1200 Printer.
3S3020AB000A3	(Export A3 model) Operates on nominal 230V AC. Used with TermiNet 300 Printer.
3S3020AA000A4	(A4 model-DPU) Operates on nominal 117V AC.
3S3020AB000A4	(A4 model) Operates on nominal 230V AC. Used with TermiNet 1200 Printer.

NOTE

Unless otherwise stated, the reference to A1, A2, or A3 model TCA means those units which are operated at 117V AC. Refer to Chapter VI for parts relationship.

SPECIFICATIONS

MAGNETIC TAPE	- 0.150 inches (0.38 cm) wide, computer grade tape certified to 1600 FC1. Housed in twin hub, co-planar, 2 1/2" x 4" (6.35 cm x 10.16 cm) Philips type cassette.
CASSETTE CAPACITY	- 300 feet (91.45 meters) 50,000 characters.
DATA TRANSFER RATE, WRITE AND READ	- 110, 150, 300, 1200 bits per second.

SPECIFICATIONS (Continued)

READ AND WRITE TAPE SPEED:

Up to 300 bits per per second (incremental)	- Less than 2 inches (5.1 cm) per second at the beginning of tape and less than 4.75 inches (12 cm) per second at the end of tape.
1200 bits per second (continuous Write)	- 4.75 inches (12 cm) per second at the beginning of tape and 11 inches (27.9 cm) per second at the end of tape.
1200 bits per second (continuous Read)	- Less than 4.75 inches (12 cm) per second at the beginning of tape and less than 11 inches (27.9 cm) per second at the end of tape.
TAPE REWIND TIME:	- (End of tape to beginning of tape, 300 feet, 91.45 meters)
Rewind	- Less than 90 seconds.
Block Rewind	- Less than 240 seconds.

TAPE REWIND SPEED:

Rewind	- Approximately 30 inches (76.2 cm) per second at the end of tape.
	- Approximately 70 inches (177.8 cm) per second at the beginning of tape.
Block Rewind	- Approximately 25 inches (63.5 cm) per second at the end of tape.
	- Approximately 11 inches (27.9 cm) per second at the beginning of tape.
TAPE ADVANCE TIME	- Less than 240 seconds (beginning of tape to end of tape, 300 feet, 91.45 meters).
TAPE ADVANCE SPEED	- Approximately 11 inches (27.9 cm) per second at the beginning of tape.
	- Approximately 25 inches (63.5 cm) per second at the end of tape.
READ/WRITE START AND STOP TIME	- Up to 300 bits per second, less than 10 msec.
	- 1200 bits per second, less than 20 msec.

INTER-BLOCK GAP

Minimum Gap Required	- 2.25" (5.67 cm) at the beginning of tape (BOT).
	- 3.75" (9.51 cm) at the middle of tape.
	- 4.75" (12.06 cm) at the end of tape (EOT).
DATA STORAGE DENSITY	- Less than 500 bits per inch (2.56 cm).
SAFETY CERTIFICATION	- Underwriters' Laboratory (UL).
	- Canadian Standards Association (CSA).
	- Federal Communication Commission, Rule 15.
POWER	- 120/230 volts AC ±10%, 50 to 60 Hertz, 40 watts.
AC Power Supply	- The AC power source which is to be used to supply power for the TCA must provide the correct voltage, current, and frequency as specified on the manufacturer's nameplate on the TermiNet product. The AC power source must be properly grounded in accordance with recognized good safety practices and must be located within six (6) feet (1.8 meters) of the

SPECIFICATIONS (Continued)

AC Power Supply (Continued) - equipment. In addition to personnel safety considerations, an AC power source not grounded in accordance with recognized good safety practices may cause erroneous equipment operation and may result in damage to the equipment.

DIMENSIONS - 6.80" H x 7.90" W x 12.85" D (approximately).

- 17.3 cm H x 20.1 cm W x 32.64 cm D (approximately).

WEIGHT - 18 pounds (approximately).

ENVIRONMENT, OPERATING (INCLUDING CASSETTE):

Temperature - 50°F (10°C) to 110°F (43°C).

Relative Humidity - 20% to 80% without condensation.

Altitude - 0 to 12,000 feet (3,658 meters).

ENVIRONMENT, STORAGE (EXCLUDING CASSETTE):

Temperature - minus 2°F (-30°C) to 160°F (+70°C).

Relative Humidity - 10% to 95% without condensation.

Altitude - 0 to 50,000 feet (15,240 meters).

ENVIRONMENT, CASSETTE STORAGE:

Temperature - +40°F (+5°C) to +122°F (50°C).

CHAPTER II

UNPACKING, INSTALLATION AND CHECKOUT

SECTION 1

UNPACKING AND INSTALLATION

Read all of the following so that you are certain all instructions that apply to your installation are performed.

UNPACKING

The TCA, accessories, and instructions are packed with packing materials in an inner shipping carton. The inner shipping carton is packed in a larger outer shipping carton with shock absorbent packing material.

Examine shipping cartons for possible damage. Immediately report any damage to shipper. Have the shipper inspect the damage before you install the TCA. Do not damage or discard shipping cartons or packing material inside of cartons. They should be used if it becomes necessary to return the Tape Cassette Accessory or ship to another location.

CAUTION

DO NOT SHIP TCA IN THE INNER CARTON ONLY.

The forward drive motor, which is mounted on a pivot plate, is held in place by a shipping screw and spacer, or an internal shipping tape. Follow instructions relative to the method used on the unit.

1. Open the top of the outer shipping carton and remove the inner shipping carton.

2. Carefully remove the TCA, accessories, and instructions from the inner shipping carton.

NOTE

Leave all operating instructions with the TCA or the customer (user).

3. Open tape deck cassette door and check for shipping screw in upper right hand corner of back plate (Figure 2-3). Remove screw and spacer. Retain screw and spacer for use when reshipping. If the screw is not present on the unit, remove the TCA enclosure, described below, to gain access to shipping tape.

4. Set the TCA in an inverted position on a firm flat surface.

5. Remove two screws on the bottom front of the unit. Turn the unit over and remove the one screw on the rear of unit above the nameplate (see Figure 2-1).

6. Carefully lift and remove the enclosure so as not to snag any wires from the TCA. (Use one hand on each side of the enclosure.)

7. Carefully pull off shipping tape inside of unit supporting the top motor. This is used for protecting the motor from damage during shipment (see Figure 2-2).

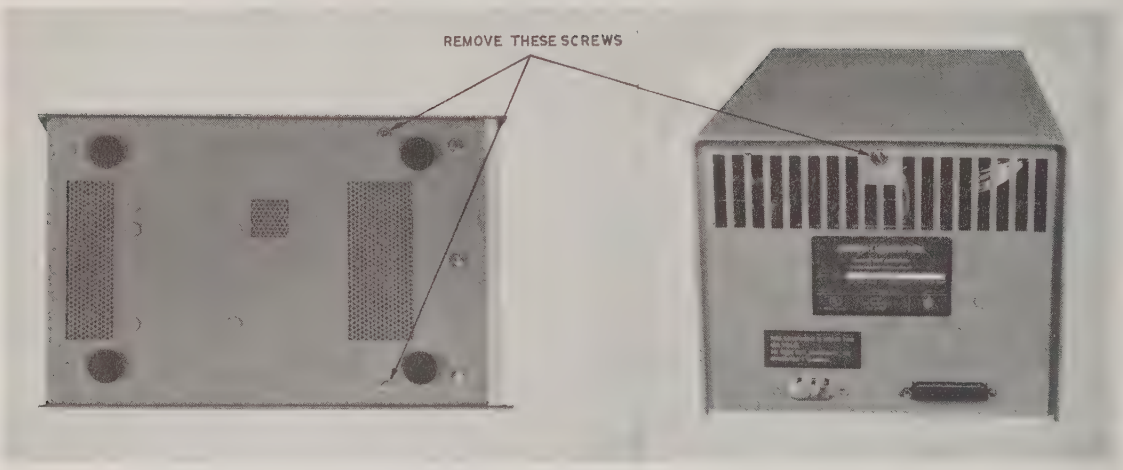
CAUTION

DO NOT REMOVE SMALL CUSHION ON TOP OF BOTTOM MOTOR (SEE FIGURE 2-2). THIS IS NOT PACKING MATERIAL AND MUST REMAIN IN PLACE DURING OPERATION OF THE TCA.

INSPECTION

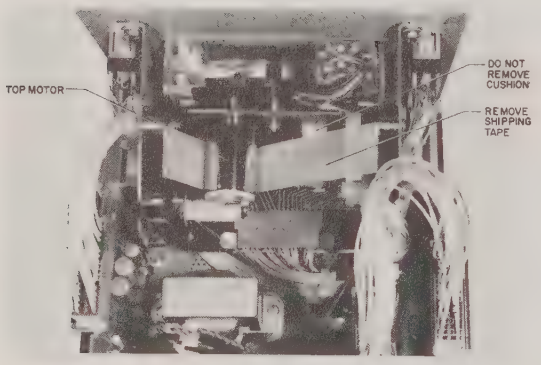
1. With the enclosure removed, check for freedom of all moving parts in the tape deck as follows:

   a. The top motor (see Figure 2-2) is attached to a rectangular plate which is pivoted at the center. The plate and motor should pivot with light downward pressure applied to the top motor.



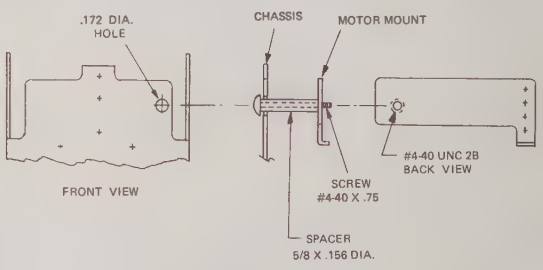
TCA-4002B

Figure 2-1. Removing TCA Cover



TCA-4022

Figure 2-2. Packing Tape and Motor Cushion



TCA-4023

Figure 2-3. Shipping Screw and Spacer

b. Open the cartridge door on the front panel by pushing in on the bottom of the door.

c. With enough downward pressure applied to the top motor to engage the motor shaft with the rubber rimmed drive wheel, reach in through the cartridge door and turn both the right and left hubs. They should both turn freely with some drag felt on the right hub.

2. Check all printed circuit board connector plugs to make sure they are firmly seated on the boards, and that all brackets securing the plug connectors are in place.

3. Check for loose or disconnected components or wires.

4. If the following *VOLTAGE CONVERSION* is not required, reinstall the enclosure and screws and proceed with *MOTHER BOARD MODIFICATION.*

VOLTAGE CONVERSION

WARNING

REMOVE ALL POWER TO THE TCA BEFORE REMOVING THE TCA ENCLOSURE.

CONVERSION FROM 117V AC TO 230V AC

1. Remove TCA enclosure (if not previously removed) per steps 3 through 6 in the preceding UNPACKING instructions.

2. Use conversion kit 44A410827-G01.

3. Replace TLP/1 printed circuit board (44B417403-G01) with TLP/2 (44B417403-G02). See Chapter V, Section 2 for removal and installation instructions.

4. Replace line cord 44A417020-001 with line cord 44A417589-G01.

5. Fasten label 44A951513-002 to rear of TCA.

6. Reinstall TCA enclosure and screws.

CONVERSION FROM 230V AC TO 117V AC

1. Remove TCA enclosure (if not previously removed) per steps 3 through 6 in the preceding UNPACKING instructions.

2. Use conversion kit 44A410827-G02.

3. Replace TLP/2 PCB (44B417403-G02) with TLP/1 (44B417403-G01). See Chapter V, Section 2 for removal and installation instructions.

4. Replace line cord 44A417589-G01 with line cord 44A417020-001.

5. Fasten label 44A951513-001 to rear of TCA.

6. Reinstall TCA enclosure and screws.

MOTHER BOARD MODIFICATION

If your Printer is a "C" model, proceed with instructions under *TRP PCB INSTALLATIONS.*

If your Printer is a "B" or "C" model and was ordered from the factory with the TCA, check to see if the TRP PCB has already been installed in the Printer's bustle. If so, proceed with the instructions under *CONNECTING THE TCA TO THE PRINTER.*

If you already have an "A" or "B" Printer and you ordered a TCA separately, the mother board must be modified so that the TCA will operate properly. Proceed with the following instruction for modifying the mother board.

NOTE

When the Mother Board is modified to operate at 1200 baud with the A2, the RATE switch must be stopped for 1200 baud in the Med or Hi position.

1. Remove power from Printer.

2. Remove bustle cover and bustle board clamp.

3. Remove KIF, PSC, SPC, POW and TRP PCB's.

4. Remove Printer from top and bottom castings.

5. Remove bustle.

6. Break run from R&P PCB connector A01 to PSC PCB connector A01 (see Figure 2-4).

7. Connect R&P PCB connector A01 to SPC PCB connector C14. Use 28 AWG or 30 AWG insulated wire (see Figure 2-4).

CAUTION

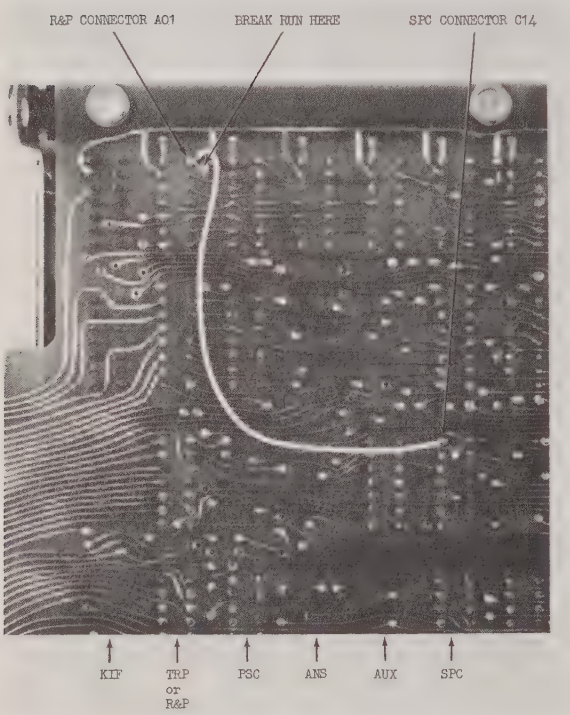
AFTER BREAKING THE RUN AND SOLDERING THE CONNECTING WIRE, THOROUGHLY CLEAN RUN FRAGMENTS AND SOLDER SPLATTER FROM THE MOTHER BOARD.

8. Reinstall bustle.

9. Reinstall Printer in castings.

10. Insert printed circuit boards.

11. Replace board hold down clamp and bustle cover.



TCA-4024

Figure 2-4. Mother Board Modification

TRP PCB INSTALLATION

The TRP Printed Circuit Board (PCB) which is packed separately with your TCA unit must be installed in the R&P PCB slot in the logic rack (bustle) of the Printer. Before installation, make certain that the board is jumpered for the intended operation (see *JUMPER OPTIONS*).

1. Remove power from the Printer.

2. Remove bustle cover and board hold down clamp (if not previously removed).

3. Insert TRP board in the "R&P" slot in bustle. Component side of board should face the left side of the Printer (as viewed from the front).

4. Replace board hold down clamp and bustle cover.

CONNECTING THE TCA TO THE PRINTER

1. Remove power from the Printer and open TCA door.

2. Using appropriate interconnection cable (refer to Chapter VI, Parts), insert the plug marked TCA in the left rear of the TCA.

3. Insert plugs marked READER and PUNCH at the other end of the interconnection cable in the left rear of the Printer.

NOTE

After verification that the AC power source is properly grounded, you may continue with the installation of the equipment. The 3-conductor AC Power Cable supplied with this TermiNet Printer product is manufactured to be in accordance with recognized good electrical safety practices. This 3-conductor AC Power Cable must be used to connect the TCA to the properly grounded AC power source.

4. Install the female end of the AC Power Cable into the AC Power Receptacle located at the rear of the TCA. Attach the other end of the AC Power Cable to a properly grounded AC power source.

5. Turn on power to Printer.

6. Insert cassette and close door. Closing the door energizes the TCA.

NOTE

For instructions on installing the cassette properly, refer to operating instructions in Chapter III.

STRAPPING OPTIONS

OPTIONS	POSITION OF WIRE JUMPERS
TRP/1 AND TRP/2 PCB'S	
- Normal operation at 10, 15 or 30 characters per second.	Both 2J and 3J jumpers removed.
- Operation at the 120 character per second rate if your Printer is set up to operate at this rate when the RATE switch is in the middle position.	Jumper 2J installed and 3J removed.
- Operation at the 120 character per second rate if your Printer is set up to operate at this rate when the RATE switch is in the bottom position.	Jumper 3J installed and 2J removed.
- Permits time delays for LF, BS, VT, FF, ESC H and ESC J (450 msec).	1J installed.
TRP/2 PCB ONLY	
- Transmit DC3 when DC3 is read on tape.	4J OUT.
- Received DC2 causes TCA to go in "Write" mode of operation, and to create an inter-block gap.	5J OUT.
TRP/3 PCB	
- Inhibits delays due to delay codes.	1J removed.
- Permits time delays for LF, BS, VT, FF, ESC H and ESC J (450 msec).	1J installed.
- 300 msec timer.	2J in (2J out causes 430 msec timer operation).
- Inhibits reading delays in ON LINE or STANDBY modes. Delays not inhibited in local.	3J in.
- Inhibits automatic inter-record gap writing after received DC2.	4J out.
- TCA stops reading before transmitting DC3.	5J out.

CAUTION

DO NOT ATTEMPT TO SOLDER JUMPERS. THEY ARE DESIGNED TO PUSH IN AND PULL OUT OF THE JUMPER CUPS ON THE PCB.

SECTION 2

CHECKOUT PROCEDURE

Perform the following checkout procedure after a TCA has been installed. This checkout procedure will check the general operating condition of the TCA. If you do not get the specified results, refer to *TROUBLESHOOTING* in this manual.

ACTION	RESULT
1. Turn Printer on. Open cassette door.	Nothing should happen. The door, when closed with cassette installed, acts as the power switch for the TCA.
2. Close cassette door with cassette installed. Refer to operating instructions in Chapter III for correct cassette installation.	TCA should be energized and the STOP pushbutton should light (also LOCK or BLOCK REWIND if on tape leader).
3. Press the LOCK pushbutton.	LOCK and STOP pushbuttons should light (also BLOCK REWIND if on tape leader).
4. Press the READ, then BLOCK REWIND, and then WRITE pushbuttons.	Nothing should happen while in the "Lock" mode (advance works in all modes and in A1 Rewind).
5. Press the LOCK pushbutton.	The LOCK pushbutton lamp should go out, and the TCA should be out of the "Lock" mode. The STOP pushbutton should remain lit (also BLOCK REWIND if on tape leader).
6. Press the ADVANCE pushbutton for approximately 5 seconds.	The tape should rapidly advance. The READ pushbutton will flash if data is sensed.
7. A1 Model - Press and hold the REWIND pushbutton.	The tape should rapidly rewind, as long as the REWIND pushbutton is pressed, to the beginning of tape and stop. The BLOCK REWIND and STOP pushbuttons should light.
A2/A3 Models - Momentarily press the REWIND pushbutton.	The tape should rapidly rewind to beginning of tape and stop. The BLOCK REWIND and STOP pushbuttons should light.
8. Press the WRITE pushbutton.	The tape should rapidly advance off the clear leader and stop; and the WRITE pushbutton should light. The STOP and BLOCK REWIND pushbutton lights should go out.
A3 Model	At 120 cps RATE switch setting, tape will continue to advance until the STOP pushbutton is pressed or DC4 code received.

Continued

ACTION	RESULT
9. With the Printer in LOCAL, type out a short message on the Printer keyboard. Set RATE switch at 10 or 30 cps. (A READY light is necessary in ON LINE for the TCA to move.)	The tape should incrementally advance each time a key is pressed.
10. When the message has been completed, write a Reader Off code (CTL S); then press the STOP pushbutton.	The STOP pushbutton should light, and the WRITE pushbutton light should go out.
11. Press the BLOCK REWIND pushbutton.	The tape should rewind to the beginning of the written message. The STOP pushbutton should light.
12. Press the READ pushbutton.	The STOP pushbutton lamp should go out and the READ pushbutton should light; and the Printer should start printing out the written message. The STOP pushbutton should light when the message is complete.
13. Press the BLOCK REWIND pushbutton.	The tape should return to the beginning of the written message. The STOP pushbutton should light.
14. Press and hold the STOP pushbutton while momentarily pressing the READ pushbutton.	The tape should advance one character space and a character should be read each time the READ pushbutton is pressed. Each character that is read should print out on the Printer.
15. Press and hold the STOP pushbutton while momentarily pressing the BLOCK REWIND pushbutton.	The tape should back up one character space each time the BLOCK REWIND pushbutton is pressed while data is on the tape.
16. Press BLOCK REWIND to return the tape to the beginning of written message. Press and hold the WRITE pushbutton and press the ADVANCE pushbutton.	The recorded message should be erased as the tape advances.
17. With TCA in the "Stop" mode, turn off printer.	All TCA indicator lights should go out.

CHAPTER III

PRINCIPLES OF OPERATION

SECTION 1

OPERATING INSTRUCTIONS

DEFINITION OF TERMS

Data - A general term used to denote numbers, letters, symbols, and control codes.

Character - A letter, digit, or symbol that can be printed; a non-printable character such as a space or a character that is used for a control function. Each character is made up of a seven bit code plus a parity bit.

Tape (Magnetic Tape) - A special polyester (or similar type material) tape that is coated with a magnetic material. The tape can be magnetized in such a way that data is stored on the tape. (Data is stored a character at a time.)

Cassette - An enclosure with two built-in spools for transportation of the tape. The cassette is usually made of a plastic or similar material.

Write - "Write" (record or store) data on the tape. The data is "Written" one character at a time.

Read - "Read" (Playback) the data on the tape. The data is "Read" one character at a time for use by the Printer.

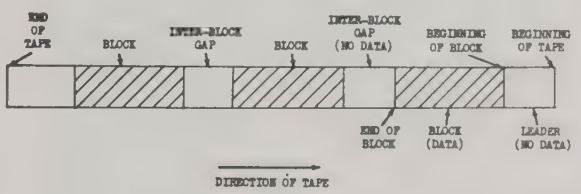
Character Space - That space required on the tape for one character of data to be stored.

Advance - Physically moving (at a rapid rate) the tape in the forward direction which is from the left spool of the cassette to the right spool.

Incremental Backup - The tape rewinds one character at a time.

"Block" and "Inter-Block Gap" - A "Block" is a set of related data on the tape. For example, a letter, parts list, computer program, etc. Several "Blocks" can be put on a tape cassette. The number of "Blocks" on a tape depends on the length of each "Block". Each "Block" must be separated by a space of blank tape called an "Inter-Block Gap". Figure 3-1 graphically shows how "Blocks" are "Written" on a tape. (Figure 3-1 is not to scale.) The actual tape is approximately 300 feet long and a "Block" may be "Written" on a few inches to several feet of tape (minimum of 6 characters to maximum of entire length of tape). Likewise, an "Inter-Block Gap" will be a few inches of tape (minimum of 2.5 inches - see specifications).

Rewind - Physically moving (at a rapid rate) the tape in the reverse direction which is from the right spool of the cassette to the left spool.



TCA-4025

Figure 3-1. How Data "Blocks" are "Written" on Tape

PUSHBUTTONS AND INDICATORS

Seven pushbutton switches are used to manually control the TCA. These pushbuttons are on the front panel of the TCA and are named LOCK, STOP, WRITE, ADVANCE, READ, BLOCK REWIND, and REWIND. These pushbuttons are pressed individually

or two simultaneously to execute most all of the control functions required (some control functions are executed with the Printer). Each pushbutton, except the ADVANCE and REWIND, is also an indicator that lights to indicate the operational status of the TCA.

NOTE

Always press pushbutton switches firmly. Do not punch or jab at switches.

CASSETTES REQUIRED

Only tape cassettes approved by General Electric Company should be used. Refer to GEJ-2748 "ORDERING SUPPLIES" for approved sources of tape cassettes.

NOTE

Magnetic tape cassettes after extended use become less reliable and can cause data loss or error. Use a new cassette if you have problems before suspecting a faulty TCA.

INDIVIDUAL OPERATIONS

CASSETTE LOADING AND HANDLING

CAUTION

DO NOT BRING CASSETTE NEAR MAGNETS OR A STRONG MAGNETIC FIELD. DATA PREVIOUSLY WRITTEN ON THE CASSETTE CAN BE ERASED IF THE MAGNETIC FIELD IS STRONG ENOUGH. TO AVOID CONTAMINATION, NEVER REMOVE A CASSETTE FROM ITS STORAGE CASE UNLESS IT IS TO BE USED IN THE TCA. DO NOT TOUCH TAPE WITH FINGER TIPS; OIL AND OTHER CONTAMINANTS ARE OFTEN ON FINGER TIPS.

LOADING

1. Press bottom of cassette door (see Figure 3-2). Door swings out approximately 35 degrees.

2. Insert cassette so that the side of the cassette marked FRONT is toward the front of the TCA and open end is down (see Figure 3-3). If the cassette is not marked FRONT, orientate the cassette so that the full spool of cassette is to your left and the open end (tape exposed) is down (see Figure 3-4). Mark cassette FRONT and insert cassette.

CAUTION

BOTH CHANNELS OF THE TAPE ARE USED AT THE SAME TIME TO RECORD DATA. THEREFORE, ONLY ONE SIDE CAN BE USED. REVERSING THE CASSETTE WILL ERASE DATA ALREADY RECORDED.

3. Press top of cassette door toward TCA to close (see Figure 3-5).

WRITE ENABLE TAB

The Write Enable tab feature prevents permanent data from being destroyed by accidental "Writing" or "Erasing". The tab is on the top left side of the cassette as viewed from the front (see Figure 3-6). If you want to permanently store the data already written on a cassette, remove the tab with a pencil or similar pointed object. Do not use an object that could be magnetized such as a screwdriver because you may destroy data on the tape. With the tab removed, the TCA will not go into the "Write" or "Erase" mode of operation; thereby permanently storing the data on the cassette. (Both tabs may be removed as an extra precaution.)

TCA-4026

Figure 3-2. Opening the Cassette Door

TCA-4027

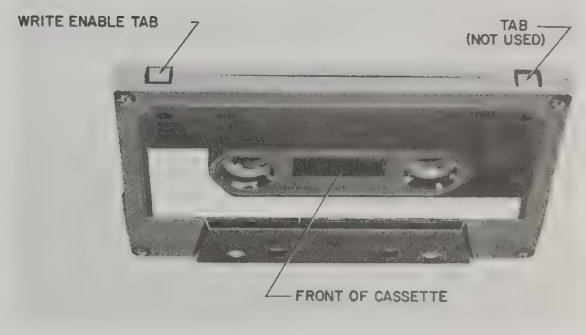
Figure 3-3. Loading Cassette

TCA-4029

Figure 3-5. Closing the Cassette Door

TCA-4028

Figure 3-4. Cassette Orientation



TCA-4030

Figure 3-6. Write Lockout Tab

CASSETTE STORAGE AND HANDLING

When you are finished using a cassette, do the following:

1. Rewind the tape in the cassette.

2. Store cassette in its container.

3. Store cassette and container in a clean location at room temperature and away from tools or large metal objects that may be magnetized.

SELECTING SPEED OF OPERATION

The RATE switch on the Printer determines the speed that the TCA will "Write" or "Read" data (10, 15, 30 or 120 characters per second). Do not transmit ("Write") from the Printer keyboard to the TCA with the RATE switch set at 120. The speed that you "Read" data is not dependent on the speed that you "Write" data. Therefore, you can read data at 10, 15, 30 or 120 characters per second (the 120 position is an option on the TermiNet 300 Printer). If operating the TCA with a TermiNet 300 Printer in the "Read" mode at the 120 characters per second rate, the INHIBIT switch must be in the PRINT position (or TRANSPARENCY switch in ON). Also, a remote TermiNet 300 Printer with a TCA receiving data at 120 characters per second must have the TRANSPARENCY switch in ON. A remote computer device can accept the data straightforward. When operating with a TermiNet 1200 Printer, the RATE switch can be at 120 and both the local and remote (TermiNet 1200 Printer) Printers can print the data from the TCA. These operations are possible providing the proper fill characters are written on the tape when preparing data for a specific "Read" rate. (Refer to TIMING CHARACTERISTICS and FILL CHARACTERS.)

NOTE

Do not change speed while the TCA is in the "Read" or "Write" mode of operation.

POWER CONTROL

The TCA can be energized only when the Printer is on. To energize the TCA, insert a cassette and close the door; the STOP pushbutton will light. If the TCA was left in the "Locked" state, the LOCK pushbutton will light also. (The TCA will not energize if the door is closed without a cassette installed.)

STOPPING THE TAPE (LOCALLY)

(See Figure 3-7)

"Write" mode of operation	- Press STOP or LOCK pushbutton.
"Read" mode of operation	- Press STOP or LOCK pushbutton.
Block Rewind condition	- Press STOP or LOCK pushbutton.
Rewind condition, A1 Model	- Tape moves only when button is held.
Rewind condition as a result of pressing the REWIND pushbutton or receiving an ESC DLE DEL code, Model A2/A3 only	- Press LOCK pushbutton. - Press BLOCK REWIND and then STOP or LOCK pushbuttons.

BLOCK REWIND

(See Figure 3-7)

When the BLOCK REWIND pushbutton is pressed, the tape will rewind rapidly (if not in the "Write" mode of operation or on clear leader) and stop at the beginning of a "Block" or on the leader at the beginning of the tape (BOT) depending on which comes first. Each time the tape stops, the STOP pushbutton will light. When the beginning of the tape is reached, the BLOCK REWIND and the STOP pushbuttons will light. To stop at a point other than the beginning of the tape or the beginning of a "Block", press the STOP pushbutton. The TCA will stop and the STOP pushbutton will light.

NOTE

In order to guarantee stopping in the gap that precedes a block of data, the block must include at least six (6) characters. (The READ pushbutton lights if passing over data.)

REWINDING THE TAPE

(See Figure 3-7)

A1 Model - To rewind the tape, press and hold the REWIND pushbutton. The tape will rewind until the pushbutton is released or the "Rewind" is complete. When "Rewind" is complete, the STOP and BLOCK REWIND pushbuttons will light.

A2/A3 Models - To rewind the tape, momentarily press the REWIND pushbutton. The tape will rewind to beginning of tape and stop: and the STOP and BLOCK REWIND pushbuttons will light.To stop the tape in REWIND, press the BLOCK REWIND then STOP or LOCK pushbuttons.

NOTE

The time to rewind from the end of tape to the beginning of tape is approximately 90 seconds.

ADVANCING THE TAPE
(See Figure 3-7)

To advance the tape, press the ADVANCE pushbutton. The tape will rapidly move forward. The tape advances only while the ADVANCE pushbutton is pressed. When the ADVANCE pushbutton is released, the TCA stops and the STOP pushbutton lights. Do not press ADVANCE while rewinding.

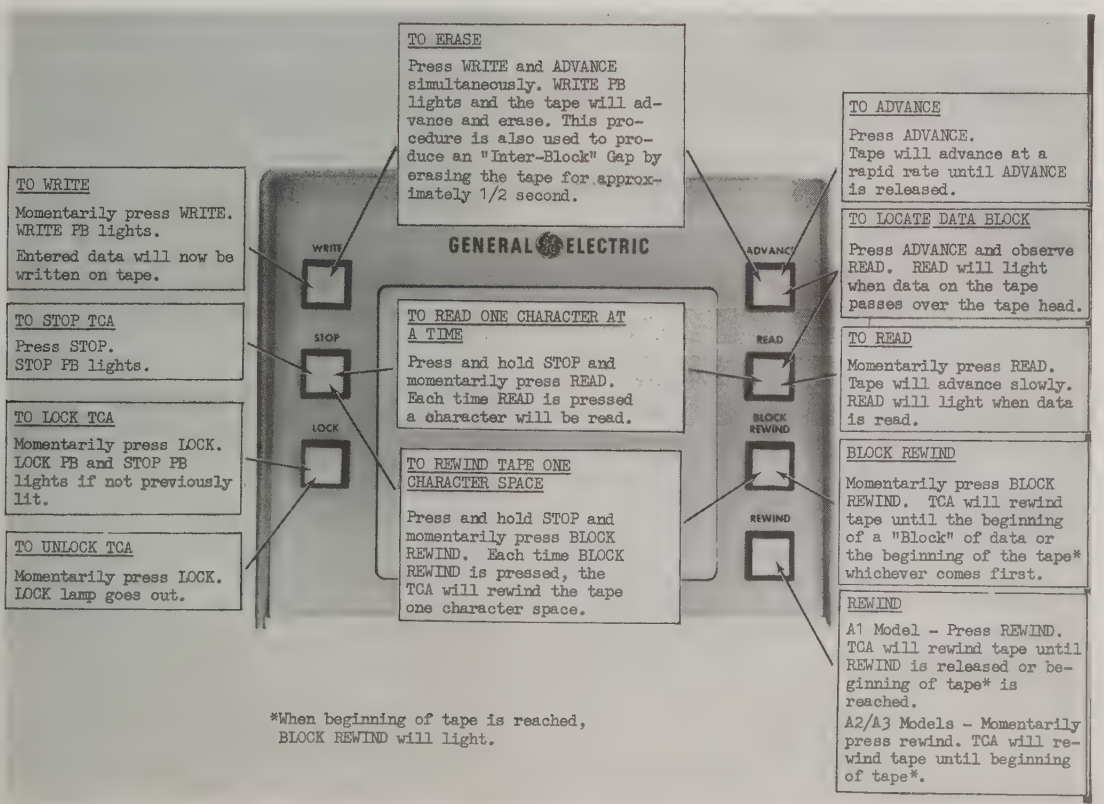
WRITING (RECORDING) ON THE TAPE (See Figure 3-7)

To "Write" on the tape (RATE switch at 10, 15 or 30 cps), press the WRITE pushbutton. The WRITE pushbutton will light. If the Write Enable tab is out, an alarm condition will exist.

NOTE

The "Write" mode of operation can only be entered when the TCA is in the "Stopped" condition (STOP pushbutton lit).

In the "Write" mode, any data you type from the keyboard or receive from another source is "Written" on the tape. When you finish "Writing" a "Block" of data you should "Write" a Reader Off Code (Control S). When "Reading" the data, the Reader Off Code stops the TCA at the end of the "Block". To stop the "Write" mode of operation, press the STOP pushbutton. The TCA can be taken out of the "Write" mode of operation by pressing the STOP, LOCK, or ADVANCE pushbutton, or by receiving a Recorder Off (DC4) code from a remote source.


TO ERASE
Press WRITE and ADVANCE simultaneously. WRITE PB lights and the tape will advance and erase. This procedure is also used to produce an "Inter-Block" Gap by erasing the tape for approximately 1/2 second.
TO WRITE
Momentarily press WRITE. WRITE PB lights.
Entered data will now be written on tape.
TO STOP TCA
Press STOP.
STOP PB lights.
TO LOCK TCA
Momentarily press LOCK. LOCK PB and STOP PB lights if not previously lit.
TO UNLOCK TCA
Momentarily press LOCK. LOCK lamp goes out.
GENERAL ELECTRIC
WRITE
STOP
LOCK
ADVANCE
READ
BLOCK REWIND
REWIND
TO READ ONE CHARACTER AT A TIME
Press and hold STOP and momentarily press READ. Each time READ is pressed a character will be read.
TO REWIND TAPE ONE CHARACTER SPACE
Press and hold STOP and momentarily press BLOCK REWIND. Each time BLOCK REWIND is pressed, the TCA will rewind the tape one character space.
TO ADVANCE
Press ADVANCE.
Tape will advance at a rapid rate until ADVANCE is released.
TO LOCATE DATA BLOCK
Press ADVANCE and observe READ. READ will light when data on the tape passes over the tape head.
TO READ
Momentarily press READ.
Tape will advance slowly.
READ will light when data is read.
BLOCK REWIND
Momentarily press BLOCK REWIND. TCA will rewind tape until the beginning of a "Block" of data or the beginning of the tape* whichever comes first.
REWIND
A1 Model - Press REWIND. TCA will rewind tape until REWIND is released or beginning of tape* is reached.
A2/A3 Models - Momentarily press rewind. TCA will rewind tape until beginning of tape*.
*When beginning of tape is reached, BLOCK REWIND will light.

TCA-4031

Figure 3-7. TCA Pushbutton Operations

If you press the WRITE pushbutton while the TCA is on the beginning of tape leader (STOP and BLOCK REWIND pushbuttons lit), the TCA will advance the tape off leader and stop: and the WRITE pushbutton will light. The tape that is advanced before the TCA stops is erased.

CAUTION

ON THE A3 MODEL, PRESSING THE WRITE PUSHBUTTON WHEN THE RATE SWITCH IS SET FOR 120 CPS WILL CAUSE CONTINUOUS MOVEMENT OF THE TAPE. IT WILL NOT STOP WHEN THE TAPE ADVANCES OFF THE TAPE LEADER, AND WILL ERASE TAPE UNTIL STOPPED.

NOTE

When the end of the tape is reached while in the "Write" mode of operation, the alarm will sound in the Printer and a break will be generated. The WRITE pushbutton will remain lit.

READING THE TAPE
(See Figure 3-7)

To "Read" the tape when in Local operation, press the READ pushbutton. The STOP lamp will go out and the tape will start moving. If in "On-Line" or "Standby" condition, the READY light (CB) must be on before the TCA can go into the "Read" mode of operation.

NOTE

The "Read" mode of operation can only be entered when the TCA is in the stopped condition.

While data is being "Read", the READ pushbutton will light. It should also be noted at this time that while you are advancing or rewinding the tape, the READ pushbutton will light as a "Block" of data is passed. This feature enables you to locate a "Block" by counting the number of times the READ pushbutton lights while advancing the tape. You can get out of the "Read" mode of operation by pressing the STOP or LOCK pushbuttons.

CAUTION

DO NOT PRESS READ PUSHBUTTON IF ON LEADER AT EOT. THIS CAN DESTROY THE RUBBER RIMMED DRIVE WHEEL.

ERASING TAPE
(See Figure 3-7)

To erase tape, press and hold the WRITE pushbutton and press the ADVANCE pushbutton. The tape is erased as it is advanced. It is important that you keep the WRITE pushbutton firmly pressed while pressing the ADVANCE pushbutton. Otherwise, you may advance the tape without erasing.

To erase a complete cassette rapidly, use a commercially available cassette bulk erase unit.

NOTE

Before using a bulk eraser, check the Write Lockout Tab. If the tab is missing, this would indicate that permanent data was stored on that cassette.

READING ONE CHARACTER AT A TIME
(10-30 cps) (See Figure 3-7)

To "Read" one character at a time, press and hold the STOP pushbutton and momentarily press the READ pushbutton. This action will increment the tape by one character and cause that character to be read. It is important that you keep the STOP pushbutton firmly pressed while momentarily pressing the READ pushbutton.

BACKING UP ONE CHARACTER AT A TIME
(10-30 cps) (See Figure 3-7)

To back up, press and hold the STOP pushbutton and momentarily press the BLOCK REWIND pushbutton. This action will cause the tape to back up one character each time the BLOCK REWIND pushbutton is pressed. It is important that you keep the STOP pushbutton firmly pressed while momentarily pressing the BLOCK REWIND pushbutton.

NOTE

If there is no data on the tape and you attempt to back up the tape by pressing the STOP and BLOCK REWIND pushbuttons or by generating the SUB control character (CTL and Z keys), the TCA will go into a "slow rewind" condition and wind to beginning of tape or first character. To stop the "slow rewind" condition, press the LOCK pushbutton. Also the "slow rewind" condition will stop when data on the tape is sensed.

SUBSTITUTING A CHARACTER (CORRECTIONS) (See Figure 3-7)

NOTE

Substituting a character cannot be performed on a tape which was received at 120 cps.

To substitute a character previously written at 30 cps or slower, perform the following:

1. Position the tape so that you have just read the character to be substituted. If you have just written the incorrect character, you are already in the correct position.

2. Press the WRITE pushbutton if not already in WRITE mode of operation.

3. Press and hold the CTL (Control) key and press the Z (SUB) key on the keyboard. This action will cause the TCA to back up and erase one character each time CTL Z is keyed.

4. Write in the desired character from the keyboard.

LOCKED MODE OF OPERATION (See Figure 3-7)

When the LOCK pushbutton is pressed, the pushbutton will light and the STOP pushbutton will light if it was not lit previously. When the TCA is in the "Locked" mode of operation, it cannot be put in the "Read" or "Write" mode of operation; and the TCA cannot be controlled by externally generated control codes if you are in an "On Line" condition. On the A2/A3 models the ADVANCE pushbutton is still active and can be pressed to move the tape; on the A1 model, the ADVANCE and REWIND pushbuttons are active.

CONTROL CODES

RECEIVED

The TCA can be operated remotely by using control codes. When the codes are received, they cause the TCA to respond as follows:

DC1 - Reader On (CTL and Q keys) - TCA goes into "Read" mode of operation if it is in the stopped condition.

DC2 - Recorder On (CTL and R keys) - A1 Model:
If at beginning of tape leader, TCA will advance off leader and stop in the "Write" mode of operation. The initial received "Recorder On" Code is not written. Subsequent received "Recorder On" codes are written.

If off leader and stopped, the TCA goes into the "Write" mode of operation. The initial received "Recorder On" code is not written. Subsequent received "Recorder On" codes are written.

A2 Model 10-120 cps and
A3 Model 10-30 cps:
Depending on how the A2 model is strapped, it will respond the same as the A1 model or as follows: If at beginning of tape leader, the TCA will advance off leader and stop in the "Write" mode of operation. The initial and subsequent "Recorder On" codes are not written. If off leader and stopped, the TCA will go into the "Write" mode of operation and momentarily erase tape, making an inter-block gap. Subsequent "Recorder On" codes will cause an inter-block gap to be made for each code received. The "Recorder On" code is never written.

A3 Model - 120 cps:
Received DC2 code causes Printer to go into "Write" mode and tape runs continuously.

DC4 - Recorder Off (CTL and T keys) - If in the "Write" mode of operation, the TCA stops and the STOP pushbutton lights.

ESC 0 (zero), Block Rewind	- TCA rewinds to the beginning of a "Block" of data or to the beginning of tape, whichever comes first.

NOTE

Block Rewind will not function if on EOT clear leader. You must rewind to get off of clear leader, then block rewind.

ESC, DLE DEL, Rewind (A2 model only)	- TCA rewinds to beginning of tape.

WRITING CONTROL CODES

Control codes can be written on the tape when the TCA is in the "Write" mode of operation, locally or on line, except for the Control Z, SUB and the Recorder Off (DC4) code. (The Recorder Off code can be written locally.)

READER OFF CODE ON TAPE (DC3)

If a Reader Off, DC3 (CTL and S keys) code is read from tape, the TCA will stop and the STOP pushbutton will light. The A1 model will not transmit the Reader Off code. The A2/A3 models can be strapped so that the Reader Off code is transmitted.

TIMING CHARACTERISTICS AND FILL CHARACTERS

Because certain non-printing operations (for example, Line Feed) require a finite amount of time, data being printed must be delayed so that it will not be lost when the non-printing operations occur. Also, an operation must be delayed, such as motor off, so that characters in memory can be printed. These time delays can be provided by using "fill" characters. In general, a "fill" character can be defined as any character in the ASCII code that does not cause an equipment action but takes time to process. The Time Delay and "Fill" Character Tables list those operations that require a time delay, the associated time, and the number of "fill" characters required if used.

In the following text of this section, a description is given on how the Printers are used with the TermiNet Cassette Accessory and Paper Punch and Reader regarding fill characters. Many of the necessary delays are provided automatically and some delays can be obtained by methods other than using the number of "Fill" characters specified in the table.

NOTE

The following text shows various examples of how fill characters are used. In these examples, the following symbols will be used:

B - Backspace
C - Carriage Return
F - Form Feed
L - Line Feed
V - Vertical Tabulation
- Fill Character

TermiNet 300 PRINTER

The following chart summarizes the time interval and "fill" character requirements for the TermiNet 300 Printer. The following text gives examples of how "fill" characters are used.

NORMAL SINGLE LINE FEED

The time delay required from the last character on a line until the first character on the next line is 300 milliseconds. This time includes the CR, LF characters and the time to decode the first character on the new line. Since at 300 baud each character time is 33.3 milliseconds, 300/33.3 equals nine character times for the required 300 millisecond delay. To produce this delay, use six fill characters in addition to the CR, LF codes and the first character on the new line.

Example One: (300 Baud)

Line 1: The TermiNet 300 Data CommunicationCL######

Line 2: Printer Operates at 30 CharactersCL######

Line 3: Per Second

CONSECUTIVE LINE FEEDS

If there are to be consecutive line feeds after a line of printing, a time delay of 350 milliseconds is required for the initial double line feed and 67 for each additional line feed. The 350 millisecond delay may be provided by eight fill characters (350/33.3 equals eleven characters less CR, LF, LF) and the subsequent 67 millisecond delay requires 2 fill characters (67/33.3 equals two characters).

TIME DELAY AND "FILL" CHARACTER CHART FOR THE TermiNet 300 PRINTER

PRINTER OPERATION	INTERVAL BETWEEN	APPROXIMATE INTERVAL IN MILLISECONDS	NON-PRINTING FILL CHARACTERS 30 cps	15 cps	10 cps	PLACEMENT OF FILL CHARACTERS
Normal Single Linefeed*	Last char. on old line and first char. on new line.	300	6	2	0	After line feed code.
Repeated line feeds	(a) Last char. on old line and second LF code.	350	8	3	1	After first line feed code.
	(b) Subsequent LF codes.	67	2	1	0	After the second and subsequent line feed codes.
Backspace**	Printing and then reprinting in same position.	230	6	3	2	After the backspace code.
Startup***	Commanding motor on and printing.	430	12	6	4	After "Motor On" code.
Shutdown****	Last data char.	300	9	4	3	Between last data character and "Motor Off" code.
Vertical Tab	VT or FF command and 1st character.	300 + (27 x No. of Lines) = Required Time Delay in Milliseconds (1)	10 + .75/ line	5 + .38/ line	3 + .25/ line	
Red and Black Printing	Before ESC Code	300	9	5	3	Before and after changing
	After ESC Code	50	2	1	1	ribbon colors

*If there is no CR, one "fill" character should be added to that shown.

**If BACKSPACE code is used more than once, it may take the place of "fill" characters; e.g., at 30 cps, to type and underscore "AND", send A N D BS BS BS fill fill fill - - - - . The delay is required to insure hammers have recovered from the previous actuation.

***The TermiNet 300 Printer will go from a motor off state to a printing or "ON LINE" state in response to the two code sequence ESC h or H, or also in the case of automatic motor on from the Data Set. The delay is required to allow the motor to come up to speed.

****The TermiNet 300 Printer will go from a printing "ON LINE" state to a motor off state in response to the two code sequence ESC j or J, by the EOT code (when jumpered), or also in the case of automatic motor off from the Data Set. The delay that precedes the motor off command is required to allow time to print any characters that are in memory waiting for the proper registration of the hammers and belt.

(1) Example:

At 30 cps with one line of VT:

[300 MS + (27 MS x 1)] = 327 MS of required time delay

30 char/sec = 33.3 MS/char

Fills required = 327 MS ÷ 33.3 MS/char.

= 9.85 CHARACTERS of Fill's

$\simeq$ 10 FILL's (always round off to next higher number).

Example Two: (300 Baud)

For one printing line followed by two non-printing blank lines:

THE TERMINET 300CL########L##LPRINTER

The above would produce:

Line 1: THE TERMINET 300

Line 2:

Line 3:

Line 4: PRINTER

BACKSPACE

The time delay required between printing and reprinting in this same position is 230 milliseconds. The delay is to insure that the print hammer has recovered from the previous actuation. The delay can be produced by using any six characters at 300 baud between the first and second printing in the same position. Backspace Codes, BS, may take the place of an equal number of fill characters.

Example Three: (300 Baud)

Type and underline the word AND:

Line 1: ANDBBB#_ _ _

will produce AND

STARTUP

A delay of 430 milliseconds is required for the Printer to go from a non-printing or STANDBY state to a printing or ON LINE state under code control. The delay allows print belt synchronization. This time delay can be produced by using twelve fill characters at 300 baud between the Motor On code, ESC H or h, and the start of data transmission.

Example Four: (300 Baud)

Line 1: ESC H ############The TermiNet 300 Printer

SHUTDOWN

A delay of 300 milliseconds is required for the Printer to go from a printing state to a motor off non-printing state in response to the code sequence, ESC J or j; by the EOT code (when jumpered) or in the case of automatic motor off from the data set. This delay allows time for characters in memory to be printed when the proper registration of the hammers and print belt occur. Use nine fill characters between the last character and the Motor Off code sequence.

Example Five: (300 Baud)

Line 1: The TermiNet 300 Printer#########ESC J

VERTICAL TABULATION AND FORM FEED

The amount of time delay required between a VT or FF command and the first character to be printed is dependent on the number of lines that are tabulated. The following formula will determine the time delay in milliseconds and number of fill characters for that delay.

a) 300 + (27 x No. of Tabulated or Form Feed Lines) = Delay (msec)

b) $\frac{\text{Delay in msec.}}{1000}$ x Characters per Second = No. of fill characters

Example Six: (300 Baud)

To vertical tabulate four lines after first printing one line of data:

a) 300 + (27 x 4) = 408 msec.

b) $\frac{408 \text{ msec}}{1000}$ x 30 = 12.2 fill characters

13 Fill Characters Required

The TermiNet 300CV############Printer

The above would produce:

Line 1: The TermiNet 300

Line 2:

Line 3:

Line 4:

Line 5: Printer

RED/BLACK (TWO COLOR) PRINTING

Time delays or fill characters are required before and after changing colors to allow all characters in the first color to be printed and allow the ribbon lift mechanism to stabilize. The time delays are 300 msec before the ESC code and 50 msec immediately after the code.

Example Seven: (300 Baud) Changing Colors in Midline

Red##########ESC4##BlackCL

Example Eight: (300 Baud) Changing Colors When Changing Lines

Line 1: BlackCL######

Line 2: ESC3##Red

TERMINET 1200 PRINTER

The following chart summarizes the time interval and "fill" character requirements for the TermiNet 1200 Printer. The following text gives examples of how "fill" characters are used.

TIME DELAY AND "FILL" CHARACTER CHART FOR THE TermiNet 1200 PRINTER

Function	Definition of Time Interval	Time Interval In Msec	Number of Characters To Equal Time Interval 120 cps	30 cps	15 cps	10 cps
Following a Printable Line Ending in Line Feed	Length of New Line including carriage return and/or platen moving code	300	36	9	5	3
Following a Non-Printable Line Ending in Line Feed	Length of New Line including carriage return and/or platen moving code	75	9	3	2	1
Following a Printable Line Ending in Vertical Tab or Form Feed	Length of New Line including carriage return and/or platen moving code	300 plus 27 per line*	36 plus 3 per line	9 plus .75 per line**	5 plus .38 per line**	3 plus .25 per line**
Following a Non-Printable Line Ending in Vertical Tab or Form Feed	Length of New Line including carriage return and/or platen moving code	70 plus 27 per line*	6 plus 3 per line	2 plus .75 per line**	1 plus .38 per line**	1 plus .25 per line**
Backspace	After BS code and including the next printable character	230	28	7	4	3
Red and Black Printing	Before ESC code After ESC code	300 50	36 6	9 2	5 1	3 1
Start-Up	After Motor-On Command and including the first printable character	430	52	13	7	5
Shutdown	After last printable character and before the Motor-Off Command	300	36	9	5	3

*A maximum of 36 printable characters may be included during this time interval.

**One character minimum - always round off to next higher number.

NOTE

Although the following data format is different from the format specified for TermiNet 300 Printers, all data formatted for TermiNet 300 Printers will be accurately printed by TermiNet 1200 Printers when operated at, or below, the baud rate for which the data was formatted. However, the efficiency of printing on the TermiNet 1200 Printer may be improved by reformatting the data to take advantage of the greater memory of the TermiNet 1200 Printer.

FOLLOWING A PRINTABLE LINE ENDING IN LF

A new line must be at least 300 milliseconds long, including the platen moving code at the end, if it follows a line which has one or more printable characters and ends in LF. This time allows the last printable character on the previous line to be printed and the line feed to be executed before the next platen moving code is received.

This rule is satisfied during normal text where LF is the only platen moving code if each line including the LF code is a minimum of 36 characters long at 1200 baud, 9 characters long at 300 baud, 5 characters long at 150 baud, or 3 characters long at 110 baud.

Example One: (1200 Baud)

```
Spacing:  12345678901234567890123456789012345678 90
Line 1:   This line requires fills ##########CL  (Can be at end of line)
Line 2:   ########## This line requires fillsCL  (Can be at start of line)
Line 3:   This line########## requires fills CL  (Can be at center of line)
Line 4:   No Fill Characters required this line CL
```

FOLLOWING A NON-PRINTABLE LINE ENDING IN LF

A new line must be at least 75 milliseconds long including the platen moving code at the end if it follows a line which has no printable characters and ends in LF.

Example Two: (1200 Baud)

```
Spacing:  12345678901234567890123456789012345678 90
Line 1:   No Fill Characters required this line CL
Line 2:   ##########################################L   (Non-Printing line ending in LF)
Line 3:   Min LineL  (Minimum line is 75 msec long or 9 characters)
```

CONSECUTIVE LINE FEEDS

A line feed immediately following a line feed at the end of a line which has one or more printable characters must follow the rule given above for "Following a Printable Line Ending in LF". Thus fill characters must be added before the new line feed to make that line 300 milliseconds long. Refer to Example two, Lines 1 and 2.

A line feed immediately following a line feed at the end of a line which has no printable characters must follow the rule given above for "Following a Non-Printable Line Ending in LF". Thus fill characters must be added before the new line feed to make that line 75 milliseconds long.

Example Three: (1200 Baud)

```
Spacing:  12345678901234567890123456789012345678 90
Line 1:   ########################################L  (Non-printing line ending in LF)
Line 2:   ########L  (75 msec or 9 fills)
Line 3:   ########L  (75 msec or 9 fills)
```

FOLLOWING A PRINTABLE LINE ENDING IN VT OR FF

Of interest here is the time interval of 300 milliseconds plus 27 milliseconds per line of form movement immediately following a VT or FF code at the end of a line including at least one printable character. A platen moving code (LF, VT, or FF) during this time interval must be the last character in the time interval. The time interval may include no more than 36 printable characters. (This restriction is 36 printable characters at all baud rates.) The remainder of the time may be taken up by time delay or fill characters.

Example Four: (1200 Baud)

```
Line 1:   12345678901234567890123456789012345678 90CV  (no fills required)
            (Vertical Tab 3 lines, 300 msec plus 3 x 27 msec = 381 msec)

          Need 381 ms of fill time while platen is moving = 46 character times

46 Character Fill Time:   36 Printing Characters max##########

Line 2:   36 Characters from Fill time plus rest of line CL
```

FOLLOWING A NON-PRINTABLE LINE ENDING IN VT OR FF

The rule here is the same as that for "Following a Printable Line Ending in VT or FF" except the time interval of interest is 50 milliseconds plus 27 milliseconds per line of form movement.

Example Five: (1200 Baud)

Line 1: 12345678901234567890123456789012345678 90CF (No fills required)
(Form Feed 3 lines, 300 msec plus 3 x 27 msec = 381 msec)
381 ms = 46 Character times

Line 2: ##V
(Vertical Tab 10 lines, 50 msec plus 10 x 27 msec = 320 msec)

39 Character fill time: 320 ms = 39 Character times

36 Printing Characters max.###

Line 3: 36 Characters in fill time plus rest of lineCL

BACKSPACE

A 230 millisecond time interval must occur between printing and reprinting in the same position. Thus a 230 millisecond time delay or the appropriate number of non-printable characters must be placed immediately after the first BS code. Some of these non-printable characters may be additional BS codes and the last character in the time interval may be printable.

RED AND BLACK PRINTING

A 300 millisecond delay (36 fill characters) is required before changing from one color to another color. Immediately after changing color a 50 millisecond delay is needed (6 fill characters). These delays allow the Printer to complete printing in the initial color and allow the ink ribbon motion to stablilize after the change.

Example Six: (1200 Baud)

To print "TermiNet" in black followed by "Printer" in red:

Line 1: TermiNet#####################################ESC 3######Printer

The ribbon will remain raised to print in red.

START-UP

A 430 millisecond time interval must occur between a Motor-On command and printable characters to allow the print belt to come up to speed. The Motor-On command may be by code (ESC h or ESC H) or by Automatic Motor Control from the data set. Place the 430 millisecond time delay or the appropriate number of fill characters immediately after the Motor-On command.

SHUTDOWN

To insure that all characters are printed, a 300 millisecond time interval must occur between the last printable character and the Motor-Off command. The Motor-Off command may be by code (ESC j or ESC J), by the EOT code (when jumpered), or by Automatic Motor Control from the data set. Place the 300 millisecond time delay or the appropriate number of fill characters immediately before the Motor-Off command.

USING THE TermiNet 300 PRINTER WITH THE TermiNet CASSETTE ACCESSORY (TCA), A1 AND A2 MODELS

NECESSARY DELAYS FOR THE PRINTER

When transmitting to a TermiNet 300 Printer, the TCA provides the necessary delays for all Printer operations at 300 baud or lower except Vertical Tab and Form Feed (delays for VT and FF are provided for local printing). To determine the number of fill characters needed for VT and FF, use the following formulas:

NOTE

When using a formula, round out answer to next highest whole number.

$$\text{10 characters per second} - \frac{300 + (27 \times \text{No. of Lines})}{100} = \text{Number of Fill Characters}$$

$$\text{15 characters per second} - \frac{300 + (27 \times \text{No. of Lines})}{67} = \text{Number of Fill Characters}$$

$$\text{30 characters per second} - \frac{300 + (27 \times \text{No. of Lines})}{33} = \text{Number of Fill Characters}$$

If you are sending information to a Terminal with a mechanical Carriage Return or some other carriage return method that takes an appreciable amount of time, you may need fill characters to supply a delay as specified by the manufacturer of the Terminal to which you are transmitting.

NOTE

In most cases, a 300 millisecond delay should be sufficient for Carriage Return. For an approximate 300 millisecond delay, use nine (9) "fill" characters at 30 cps, five (5) "fill" characters at 15 cps, and three (3) "fill" characters at 10 cps.

WRITING AT 120 CPS

When writing at 120 cps (recording on tape from keyboard cannot be done at 120 cps, only at 10 or 30 cps), there must be a "fill" character at the beginning of data to be written. This allows the TCA to come up to speed before the valid data is written; otherwise, the first character of valid data would be lost. The "fill" character is not recorded. The "beginning" of data includes any time when 8 milliseconds have elapsed since data was received.

If it is anticipated that a tape being made will be used to make a second tape in another TCA (at 120 cps), a "fill" character should be written at the beginning of data. If a third tape is made from the second tape, two (2) fill characters should be written on the first tape.

For example, Tape 1 is written from the keyboard at 30 cps (or less) with two (2) "fill" characters.

- Tape 1 is used to write Tape 2 (in another TCA) at 120 cps. Since one (1) "fill" character is lost, Tape 2 has one (1) "fill" character.
- Tape 2 is used to write Tape 3 (in another TCA) at 120 cps. The "fill" character is lost and Tape 3 has no "fill" character.
- If Tape 3 was used to make a fourth tape, the first character of data would be lost.

From the preceding example, you can conclude that the anticipated number of times the data is rewritten in the manner described will dictate the number of "fill" characters that should be written on the first tape.

ON LINE INTER-BLOCK GAP (A2 MODEL)

A received "Recorder On" Code (DC2) will initiate an inter- block gap. The transmitting Printer must provide a minimum time delay of 300 milliseconds after the transmission of the DC2 code so that data is not sent while the receiving TCA is generating an inter-block gap. Insert the fill characters after the DC2. For an approximate 300 millisecond delay, use nine (9) "fill" characters at 30 cps, five (5) at 15 cps, and three (3) at 10 cps.

USING THE TermiNet 1200 PRINTER WITH THE TermiNet CASSETTE ACCESSORY (TCA), A3 MODEL

RECORDING

Incremental Rates

Recording on tape from the keyboard is straightforward at incremental rates (10 or 30 cps), but cannot be done at 120 cps. At incremental rates, characters are recorded as keyed in. Characters which may require delays in the Printer when read out (LF, BS, VT, FF, ESCH, ESCJ, DC3) are followed by a short space of blank tape to enable the tape unit to stop and start when reading at non-incremental rate (120 cps). This blank tape (about 3 character spaces) is written in approximately .024 second. This will not result in any noticeable delay to the operator. In addition to the blank tape generated, VT and FF must be followed by 2 fill characters.

When writing a tape at an incremental rate from an automatic data source, time must be allowed to write the required space on tape. There is always ample time for this at 10 cps. At 30 cps, time must be provided after delay characters. One fill is sufficient for all delay codes except VT and FF which must be followed by three fill characters.

NOTE

If the Printer motor is on, the Fill Character rules for the Printer must also be satisfied.

In addition to the delay characters listed in the above paragraph, a DC2 code must be followed by 300 msec. of delay time or the appropriate number of Fill characters (at 120 cps - 36 fill characters) to allow for the writing of Inter-Block Gap. Recording is not dependent on the state of the Data Set Interface leads.

Should an operator "get ahead" of the recording mechanism by typing while a space is being written, an alarm will be generated. This is very unlikely for keyboard data but could occur for an answerback sequence. This alarm will light the alarm lamp, turn off the motor, transmit a break, and sound the alarm. This action is for local data only. Received data cannot cause this alarm, facilitating the use of Fill Characters for timing. If adequate fill characters are not included, received data may be lost (not copied on tape).

In Transparency

Data received in Transparency is recorded exactly as received. Therefore, no automatic spaces are generated and each delay character must be followed by 3 Fill Characters (5 Fills after VT or FF). Delay time may not be substituted for these Fill Characters when recording incrementally.

Non-Incremental Rate

Magnetic Tape recording at 1200 baud is done differently with the TermiNet 1200 than the TermiNet 300. Unlike the TermiNet 300, operation with the TermiNet 1200 at 1200 baud is not character dependent. Whenever the terminal is in the 1200 baud rate position, and the A3 TCA in RECORD Mode, the TCA will move tape at the proper rate for 1200 baud recording, regardless of the condition of the data stream except during VT or FF motion. Data transmitted to the TermiNet 1200 should contain all fills required for printing, with the added condition that every LF code should be followed by 3 fills or 24 msec. of time. If the Printer is receiving the transmission in Transparency or Standby, then 3 Fills or 24 msec. of time should follow each delay character except VT or FF codes which must be followed by 5 Fills or 41 msec. Recording is not dependent on the state of the Data Set Interface signals.

READING (Incremental or Non-Incremental)

The A3 Model TCA does not delay after every LF code when reading. An internal timer will cause delays to guarantee the minimum time required for the TermiNet 1200 operation. LF, BS, VT, and FF characters will be separated by 300 msec. if they appear closer than this in the data stream. Timing for VT and FF will be as required for proper operation (closed Loop TCA to TermiNet). The TCA will always delay a full 300 msec. for MOTOR ON and MOTOR OFF (ESC H and ESC J). A strap is included to vary the timer. With the jumper out, the timer will run at 430 msec., long enough for all codes. With the jumper in, the timer will run 300 msec., which is adequate for all codes except MOTOR ON. Fill Characters (additional 16 Fills) must be recorded after the MOTOR ON, if the 300 msec. timing is used. If the Printer is in Transparency, no delays will occur.

When the Printer is on ON LINE or STANDBY, the Data set Interface Signal Clear to Send (CB) must be present to read tape. If a DC3 code or an Interrupt is received, the TCA will stop reading after the next character is read.

TIME DELAY AND FILL CHARACTER CHART

The chart on the following page summarizes the time delays and fill characters required when using the A3 TCA with the TermiNet 1200 Printer.

INTERCHANGEABILITY OF RECORDED CASSETTES

Cassettes recorded on an A3 TCA can always be read on an A2 TCA. A cassette recorded on an A2 model TCA can be played back on an A3 model at 10 or 30 cps. In general, an A2 recorded cassette cannot be read on an A3 model at 120 cps. It can, however, be played back in transparency. Further, an A3 compatible tape can be recorded on an A2 model by following each delay character with 3 Fill codes at recording (5 Fills for VT or FF).

A3 TCA TO PAPER TAPE PUNCH

Punch does not operate at 120 cps.

No special Fills at 10 and 30 cps.

PAPER TAPE READER TO A3 TCA

No Fills required at 10 and 30 cps except after VT, FF, and DC2.

At 120 cps, only transmission with delays inhibited (no printing) is permitted. All required Fills must be on the paper tape.

TIME DELAY AND FILL CHARACTER CHART

FOR USING THE A3 MODEL TCA WITH THE TermiNet 1200 PRINTER

CODE	MOTOR ON KEYBOARD DATA	MOTOR ON 10 CPS DATA	MOTOR ON 30 CPS DATA	MOTOR ON 120 CPS DATA	MOTOR OFF KEYBOARD DATA	MOTOR OFF 10 CPS DATA	MOTOR OFF 30 CPS DATA	MOTOR OFF 120 CPS DATA
LF	None	(Note 1) Printer Req.	(Note 6) Min. - 24 msec. Max. - Printer Req.	Min. 24 msec Max. Printer Req.	None	None	(Note 2) 24 msec.	24 msec.
VT or FF	(Note 3) 2 Fills	Min. - 2 fills Max. - Printer Req.	Min. - 24 msec. plus 2 fills. Max. - Printer Req.	Min. - 24 msec. plus 2 fills. Max. - Printer Req.	2 Fills	2 Fills	24 msec. plus 2 fills	24 msec. plus 2 fills
(Note 4) BS	None	Printer Req.	Min. - 24 msec. Max. - Printer Req.	Min. - 24 msec. Max. - Printer Req.	None	None	24 msec.	24 msec.
ESC H 2J Out on TRP/3	None	Printer Req.	Printer Req.	Printer Req.	None	None	24 msec.	24 msec.
ESC H 2J In on TRP/3	16 fills	16 fills	24 msec. plus 16 fills	Min. - 24 msec. plus 16 fills. Max. - Printer Req.	16 fills	16 fills	24 msec. plus 16 fills.	24 msec. plus 16 fills.
(Note 5) ESC J	None	None	24 msec.	24 msec.	None	None	24 msec.	24 msec.
Received DC2	N/A	(Note 6) 300 msec.	300 msec.	300 msec.	N/A	300 msec.	300 msec.	300 msec.
DC3	None	None	24 msec.	24 msec.	None	None	24 msec.	24 msec.

NOTES:
1. Printer Req. refers to the fill characters which are required by the Printer.
2. When delay time is referenced, either delay time or fill characters may be used. In Transparency, Fill Characters must be used.
3. When fill characters are referenced, fill characters must be used. Delay time may not be substituted.
4. A single backspace must be accomplished by BS, BS, Space to ensure the proper delay when the data is played back. The fill characters indicated are required after each of those BS codes.
5. The fill characters listed for ESC J are required by the TCA after the code. Fill characters are also required by the Printer before the code when the motor is on.
6. 24 msec at 30 cps = 1 "fill", at 120 cps = 3 "fills"; 300 msec at 10 cps = 3 "fills", at 30 cps = 9 "fills", at 120 cps = 36 "fills".

USING THE TCA

WRITING A "BLOCK" OF DATA (10-30 cps)

NOTE

There are restrictions on the interchangeability of cassettes. Assume starting with a new or bulk erased cassette. A cassette written on by TCA "A" can be read by TCA "A", "B", "C", etc. When writing on this cassette with TCA "B" without being bulk erased, the cassette shall only be read by TCA "B".

1. Load cassette into TCA.

2. Completely rewind cassette to beginning of tape.

3. If you are "Writing" on an erased cassette or a cassette that is being erased while "Writing", proceed with step 5. If you are "Writing" on a cassette that contains data you don't want erased, you must advance the tape past the last "Block". For example; if there are 5 "Blocks" on the cassette, advance the tape until the READ pushbutton lights and goes out 5 times. Then erase the tape approximately 1/2 second to establish an "Inter-Block Gap".

4. Press the WRITE pushbutton. The WRITE pushbutton lights and you are ready to "Write" data. Proceed to step 6.

5. Press the WRITE pushbutton. The WRITE pushbutton lights and the tape moves off of the leader. You are ready to "Write" data.

6. "Write" in data.

NOTE

When copying data continuously from one TCA to another TCA, regardless of speed (no "Reader Off" Code), any original inter-block gaps are automatically eliminated (except on A3 model at 120 cps). To preserve an inter-block gap under these conditions, write a "Recorder On" (DC2) code and the appropriate number of fill characters at the end of each block. (See "Fill" Characters, "On Line Inter-Block Gap".) This will cause the TCA to momentarily erase tape for an inter-block gap.

7. After you complete "Writing" the data, "Write" a Reader Off Code by simultaneously pressing the "CTL" and "S" keys.

8. Erase the tape for 1/2 second to establish an "Inter-Block Gap" at the end of the "Block" you just made.

9. Record the number and title of the "Block" that you just made. If you made the new "Block" after "Block 5" as in the example given in step 3, the new "Block" number would be 6. If you made the first "Block" on a cassette, the "Block" number would be 1.

LOCATING AND READING A "BLOCK" OF DATA

1. Load cassette into TCA.

2. Completely rewind the cassette if it is not already in the rewound condition.

3. Determine which "Block" number you need.

4. Advance the tape and count the times the READ pushbutton lights and goes out. When the count is the same as the number of the "Block" you want, stop the tape.

5. Press the BLOCK REWIND pushbutton. The tape should rewind and stop at the beginning of the "Block" you selected.

6. Select the speed you wish to "Read" by setting the RATE switch on the control panel of the Printer. If a 120 cps rate is selected on a TermiNet 300 Printer, the Inhibit switch must be set to INHIBIT PRINT position or TRANSPARENCY ON.

7. Press the READ pushbutton. The TCA will read the selected "Block" which can be printed and/or transmitted to another location.

NOTE

If the Printer is "On Line", the "Ready to Send" (CB) condition (READY light on) must exist. If not, the TCA will not enter the read mode of operation and will not start reading until CB is on.

MAKING CORRECTIONS

If you make an error while writing a "Block" from the keyboard, or find an error while reading a "Block", you can substitute the incorrect character with the correct character as follows:

1. -Back up one character at a time, by pressing the STOP and BLOCK REWIND pushbuttons, until you back over the incorrect character.

-If it is more convenient, print one character at a time, by pressing the STOP and READ pushbuttons, until you print the incorrect character. If you do this, proceed with step 3.

2. Print the selected character by pressing the STOP and READ pushbuttons, to verify you are on the character to be substituted.

3. Press the WRITE pushbutton. The WRITE pushbutton will light.

4. Press and hold the CTL (Control) key and press the Z (SUB) key on the keyboard. This action will cause the TCA to rewind the tape to back up and erase one character each time CTL Z is keyed.

5. Write in the desired character from the keyboard.

FUNCTIONAL RESPONSE CHART

(See Figure 3-8)

The Functional Response Chart is a quick reference for operating the TCA. The extreme left hand column describes the TCA's mode of operation. The extreme top row describes an action. By intersecting the appropriate column with the appropriate row, the resulting block will describe the TCA's response to the action taken.

ACTION / CONDITION	CONTROL PUSHBUTTONS (PB)							CONTROL CODES							
	PRESS WRITE	PRESS HEAD	PRESS STOP	PRESS ADVANCE	PRESS BLOCK REWIND	PRESS REWIND	PRESS LOCK	READ DC3 READER OFF	RECEIVE DC1 - READER ON	RECEIVE DC2 RECORDER ON	RECEIVE DC3 - READER OFF	RECEIVE DC4 - RECORDER OFF	RECEIVE ESC 0 BLOCK REWIND	[A2 Model Only] RECEIVE ESC DLE DEL-REWIND	RECOGNIZE CTL Z - SUB
STOPPED ON BEGINNING OF TAPE LEADER (CLEAR TAPE). STOP AND BLOCK REWIND PB ARE LIT.	Tape advances rapidly off leader and stops. STOP and BLOCK REWIND PB lamps go out and WRITE PB lights when TCA is in "Write" mode of operation.	Tape advances off leader. STOP and BLOCK REWIND PB lamps go out and the TCA goes to "Read" mode of operation. READ PB lights when data is read.	No Change.	Tape advances rapidly while PB is pressed and the BLOCK REWIND PB goes out. When data is sensed on the tape while advancing, the READ PB will light	No Change.	*STOP & BLOCK REWIND PB light. A1 Model Tape rewinds to beginning of tape leader and TCA goes into stalled condition. Press LOCK to reset TCA. A2/A3 Models-Attempts to rewind for approximately 1 second, then returns to stop mode	LOCK PB lights		Tape advances off leader, STOP and BLOCK REWIND PB lamps go out, and the TCA goes to "Read" mode of operation. READ PB lights when data is read.	Tape advances rapidly off leader and stops. STOP and BLOCK REWIND PB lamps go out and WRITE PB lights. TCA is in "Write" mode of operation. A3 continuously runs @ 120	No Change.	No Change.	No Change	*Attempts to Rewind for about a second, then stops.	**INVALID OPERATION
STOPPED ON END OF TAPE LEADER (CLEAR TAPE). STOP AND BLOCK REWIND PB ARE LIT.	*Tape advances to end of leader and stalls until a protection circuit times out and the advance stops. Printer sounds alarm, turns off motor, transmits interrupt, and lights INTERRUPT PB. Stop PB lamp goes out and WRITE PB lights.	**INVALID OPERATION	No Change.	**INVALID OPERATION	No Change.	A1 Model Tape rewinds while PB is pressed. A2/A3 Models-Tape rewinds to beginning of tape after REWIND PB is momentarily pressed.	LOCK PB lights.		*Tape advances to end of leader. TCA goes into stalled condition, STOP light goes out.	*Tape advances to end of leader and stalls until a protection circuit times out and the advance stops. Printer sounds alarm, turns off motor, goes to standby, transmits interrupt, and lights INTERRUPT PB.	No Change.	No Change	No Change.	Tape rewinds to beginning of tape	**INVALID OPERATION
STOPPED OFF LEADER. STOP PB IS LIT	TCA goes into "Write" mode of operation. WRITE PB lights and the STOP PB lamp goes out	STOP PB lamp goes out, tape advances, and the TCA goes into "Read" mode of operation. READ PB lights when data is read. (Depends on CB when on line.)	No Change	Tape advances rapidly while PB is pressed. When data is sensed on the tape while advancing, the READ PB will light	Tape rewinds to beginning of last block of data or beginning of tape leader, whichever comes first.	A1 Model-Tape rewinds while PB is pressed. A2/A3 Models-Tape rewinds to beginning of tape after REWIND PB is momentarily pressed	LOCK PB lights.		STOP PB lamp goes out, tape advances, and the TCA goes into "Read" mode of operation. READ PB lights when data is read. (Depends on CB when on line.)	A1 Model TCA goes into "Write" mode of operation. WRITE PB lights. A2/A3 Models Same as A1 except the tape is momentarily advanced and erased to create an "Inter-Block Gap". A3 @ 120 continuously runs	No Change.	No Change	Tape rewinds to beginning of last block of data or to beginning of tape leader, whichever comes first.	Tape rewinds to beginning of tape	**INVALID OPERATION
READ MODE OF OPERATION. READ PB LIGHTS WHEN DATA IS READ.	**INVALID OPERATION	No Change.	Tape stops on character. STOP PB lights. If not on data, tape continues to move approximately 1/4 inch, then stops	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	Tape stops. STOP and LOCK PB light	Tape stops on character and STOP PB lights	No Change.	No Change.	Tape stops on character. If tape contains no data, the TCA continues to read to the end of tape, then stops	No Change.	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION
WRITE MODE OF OPERATION. WRITE PB IS LIT.	No Change.	No Change.	WRITE PB lamp goes out and the STOP PB lights. TCA is now in stopped condition.	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	"Write" mode of operation stops and WRITE PB lamp goes out. STOP and LOCK PB light.		"Reader On" code is written on the tape.	A1 Model "Recorder On" code is written on tape. A2/A3 Models-Tape is momentarily advanced and erased to create an "Inter Block Gap". "Recorder On" code is not written on tape. *** A3 @ 120 continuously runs	"Reader Off" code is written on tape	WRITE PB lamp goes out and the STOP PB lights. TCA is now in stopped condition. "Recorder Off" code is not written.	ESC 0 (Return) code is written on tape	ESC DLE DEL code is written on tape.	TCA rewinds the tape to the beginning of the previous character on the tape
REWINDING TO BEGINNING OF DATA OR BEGINNING OF TAPE AS A RESULT OF PRESSING BLOCK REWIND PB OR RECEIVED ESC 0.	**INVALID OPERATION	**INVALID OPERATION	"Rewind" stops and STOP PB lights. TCA is now in stopped condition.	**INVALID OPERATION	No Change.	**INVALID OPERATION	"Rewind" stops and STOP and LOCK PB light.		No Change.	No Change.	No Change.	No Change	No Change.	No Change	**INVALID OPERATION
STOP PB PRESSED WHEN STOPPED OFF TAPE LEADER STOP PB IS LIT.	**INVALID OPERATION	When on data, one character is read and TCA returns to stopped condition. When off data, tape moves approximately 1/4 inch and stops.			Tape rewinds one character and stops. If there is no data encountered, the tape rewinds to the beginning of tape.	A1 Model Tape rewinds while PB is pressed. A2/A3 Models Tape rewinds to BOT after PB is momentarily pressed.	*LOCK PB lights.		**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION
WRITE PB PRESSED WHEN STOPPED OFF LEADER. WRITE PB IS LIT.		No Change.	**INVALID OPERATION	Tape advances rapidly and is erased while the WRITE and ADVANCE pushbuttons are pressed simultaneously.	**INVALID OPERATION	**INVALID OPERATION	*WRITE PB lamp goes out, and STOP and LOCK PB light		**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION	**INVALID OPERATION
LOCKED CONDITION AS A RESULT OF PRESSING THE LOCK PB. STOP AND LOCK PB ARE LIT.	No Change.	No Change.	No Change.	Tape advances rapidly and the STOP PB lamp goes out while ADVANCE is held.	No Change.	A1 Model-Tape rewinds while PB is pressed. A2/A3 Models-No Change.	LOCK PB lamp goes out and the TCA returns to the STOP mode.		No Change.	No Change.	No Change.	No Change.	No Change	No Change.	**INVALID OPERATION

*A result from actions that should not be performed during normal operation
**Those blocks marked "INVALID OPERATION" should never be performed. If performed accidently, stop any resulting TCA operation by pressing the LOCK pushbuttons
***Depends on how the A2 Model TRP is configured during installation

TCA-4032

Figure 3-8. Functional Response Chart

SECTION 2

FUNCTIONAL OPERATION

FUNCTIONAL DESCRIPTION OF PRIMARY CIRCUITS

The following are functional descriptions of the major circuits in the TCA. The descriptions are oriented or grouped by the Tape Deck or each Printed Circuit Board.

Most of the TCA circuits are contained on five Printed Circuit Boards (PCB's). Four PCB's are contained in the TCA and one TRP PCB is in the R&P slot on the Printer. The TRP PCB contains most of the logic control circuits while PCB's in the TCA enclosure contain the power supply, the analog circuits, and the tape deck control amplifiers.

NOTE

Along with the circuit descriptions, the following functional flow diagrams, and the signal definition list and elementary drawings in Chapter IV should assist you in understanding how the TCA operates.

THE TAPE DECK

A two-channel cassette transport is in the front panel of the TCA enclosure. Two permanent magnet DC motors drive the spindles on which the cassette spools are mounted. The reverse spindle is directly driven by the shaft of the reverse motor. The forward spindle is driven by a 10:1 speed reduction from the forward motor. A solenoid moves the forward motor pinion roller (shaft) against the forward spindle rubber rimmed drive wheel when the tape is being advanced or in the "Read", "Write", or "Block Rewind" modes of operation. When power is off or when the cassette is to be rewound, this solenoid is de-energized to disengage the forward motor.

During "Write" and incremental print rates, the forward spindle is driven (incrementally) at 45 rpm to provide a surface speed of approximately 2 inches per second at the beginning of tape. At the end of the tape, the surface speed is increased to approximately 4.5 inches per second. The forward motor attains regulated speed in about 10 milliseconds, and at beginning of tape approximately 0.01 inch of tape is used on start-up. Incremental writing is at 1000 bits per second, and approximately 0.01 inch of tape is used to write one character. Another 0.01 inch is used during stopping so that the total space required for a character at the beginning of tape is about 0.03 inch. The writing density at beginning of tape is 500 bits per inch. At the EOT the density is approximately 200 bits per inch.

The two channels of the deck are used in a serial writing method which is called the mark sequence technique. With this technique, marks for logic zero are written on one channel and marks for logic one are written on the other channel. With this arrangement, a mark will always be present at each bit time, and an OR gate may be used to merge the mark impulses when they are read back so that a strobe signal is available for data recovery. Read data is formed by driving the set and reset inputs of a flip-flop with the mark impulses from the two channels. The output of this flip-flop signal PD (Playback Data) is shifted into the character buffer (in the TRP PCB) by the strobe signal during the read operation.

To provide a start bit for each character, a mark is written in both the zero and the one channel. When reading, this simultaneous occurrence of a mark in both channels is detected by an AND gate to produce a start pulse ST. The ST pulse is used on the TRP to initiate the bit counting sequence.

TRP PRINTED CIRCUIT BOARD

Most of the logic control circuits are in the V chip on the TRP PCB. The main circuits in the V chip are as follows:

1. The Record (Write) flip-flop establishes the Write mode of operation. It is set by a received DC2 code or the WRITE pushbutton. It is cleared by either a received DC4 code or by the STOP, LOCK, or ADVANCE pushbuttons.

2. A Read flip-flop establishes the read mode of operation. It is set by either the READ pushbutton or a received DC1 code. It is cleared by a DC3 code read from tape or by the Read Stop flip-flop at STIN time. This Read Stop flip-flop is reset by either the STOP, LOCK, or ADVANCE pushbuttons or a received DC3 code.

3. The Character Buffer is an eight bit shift register. It is capable of either receiving data in parallel form from the SPC PCB (in the Printer) and transmitting it to the tape write amplifiers in serial form, or accepting serial data from the tape read amplifier and transmitting it to the PSC PCB (in the Printer) in parallel form.

4. A Shift Counter controls the action of the character buffer as well as providing timing for both the Read and Write sequences. It is a four bit down counter which is set at the beginning of character transfer, either by relaxation of the start multivibrator during write or by the lead bit of the character during read. It is counted by a clock pulse which is derived either from the write timing or the playback data, depending on which mode of operation the TCA is in. During Read, the final count on the shift counter produces ISWIP to strobe the character to the PSCC board.

5. Various decoding circuits sense those control codes which pertain to the TCA, and an Escape flip-flop stores the Escape code on playback.

6. The Run flip-flop controls the motion of the TCA. It is set during Write on a Character Strobe (CS) and during Read on a strobe in (STIN). It is also set initially at the start of Read. This flip-flop is always cleared when the shift counter returns to zero.

7. The Reverse flip-flop controls the direction of tape motion. It is only used when in incremental reverse as a result of the control substitute function. The Substitute code sets this flip-flop. It is cleared when the Run flip-flop is cleared.

8. The Line Feed multivibrator on the TRP PCB provides a fixed 450 ms time delay for the following codes: Line Feed, Form Feed, Vertical Tab, Backspace, Motor Off, and Motor On. It is set by a signal LMT which results from the sensing of these codes in the V chip during the Read mode of operation.

The Line Feed multivibrator on the A3 model TRP/3 PCB may be jumpered for either 300 msec or 430 msec operation which affects the following codes: Line Feed, Form Feed, Vertical Tab, Backspace, ESC J, ESC H, and DC3 (all of A2 model codes plus DC3). Fill character requirements are dependent on the jumper option.

9. The On-Line Inter-Record Gap (IRG) decoder enables writing an IRG under control of a remote terminal. With TCA in stop mode, a received "DC2" code shall put the TCA in write mode and initiate writing an IRG. If initially in write mode, a received "DC2" shall initiate writing an IRG. The transmitting terminal must provide a minimum time delay of 300 ms, including the transmission of "DC2", to allow the IRG to be created. "FILL" characters may be employed to create this delay because data is suppressed from being recorded during IRG. With IRG enabled, received "DC2" codes will not be recorded.

This function is not available with an A1 model TCA. To inhibit writing an IRG with an A2 or A3 model TCA, see jumper chart.

10. Multiplexing of signals into the V chip is used to limit the number of input/output pads on the V chip. Multiplexing is accomplished with the two phase clocking system used in the Printer. One signal is transmitted from the discrete circuits into the pad on phase one and sensed inside the chip by that same clock phase. A second signal is handled in the same way by phase two.

TPS PRINTED CIRCUIT BOARD

The power supply on the TPS PCB provides regulated voltages of +15 and -15 to power all circuits on this board, and regulated voltages of +10 and -10 for the tape deck. This power supply provides electronic overcurrent protection without the use of fuses. This overcurrent protection is reset by turning the TCA off and back on again. A trip condition would occur only when a circuit fault or overcurrent condition exists.

The Write Clock oscillator is a free-running multivibrator which provides a 1000 Hz timing signal for incremental write at print rates. When the write rate is 120 characters per second, this oscillator changes speed and provides a 2200 Hz timing signal.

The forward motor solenoid driver circuit energizes the forward motor solenoid for normal operation and drops out the solenoid for rewind. The Reverse Motor Driver circuit selects the proper current for the reverse motor. Full current is applied to the reverse motor for rewind or Block Rewind and a reverse drag current is applied as necessary during normal Read, Write, and Advance operations.

In the A2/A3 models only, a Rewind to BOT flip-flop is set by the REWIND pushbutton or a received ESC-DLE-DEL for the rewind function. On A1 models, the Rewind pushbutton must be held in the pressed position.

TLP PRINTED CIRCUIT BOARD

The TLP PCB contains the line voltage filter, power relay, and line power fuse.

TUC PRINTED CIRCUIT BOARD

The Advance multivibrator provides automatic movement of the tape off the beginning of tape leader when the write operation is established. It is set by the beginning of tape leader signal and the Record flip-flop.

The Rewind flip-flop is set by the BLOCK REWIND pushbutton or a received ESC 0. The Rewind multivibrator provides sufficient time for the tape to move off the end of tape leader. When a Rewind command is received, the Rewind multivibrator is set and the Rewind flip-flop cannot be cleared until the multivibrator has relaxed. The Block Rewind flip-flop is set by either the BLOCK REWIND pushbutton or a received escape-zero.

Amplification of the playback signals from the tape deck is accomplished with two operational amplifiers which act as Schmitt triggers. They convert 100 millivolt impulses to logic levels CA and CB. Signals CA and CB are combined to produce a start pulse ST and a set of read clock pulses. The tape clock signal is derived from the playback signals (CA or CB) or Write clock oscillator when in Write.

Other circuits on the TUC PCB are the lamp driver, Read preamplifiers, Write amplifiers, and character rewind circuit. Two potentiometers are provided for speed adjustments.

TMC PRINTED CIRCUIT BOARD

Two cascaded operational amplifiers, the motor drive amplifier and the feedback amplifier, control the forward servo motor. A speed reference current applied to the motor drive and the feedback signal from the feedback amplifier is summed by the motor drive amplifier to provide the correct drive current to the forward motor. The feedback amplifier gets its input from the armature of the forward motor. There are three forward speeds. The slower speed is for regular operation at incremental read and write rates. The medium speed is for writing and reading at 120 characters per second. The fast speed is for advancing tape.

End of tape is sensed by the change of resistance in the photocell on the tape deck. When light is removed from this cell, its resistance increases, causing the photocell amplifier output to produce an end of tape signal, ET. This signal will cause a tape out alarm if in the Write mode.

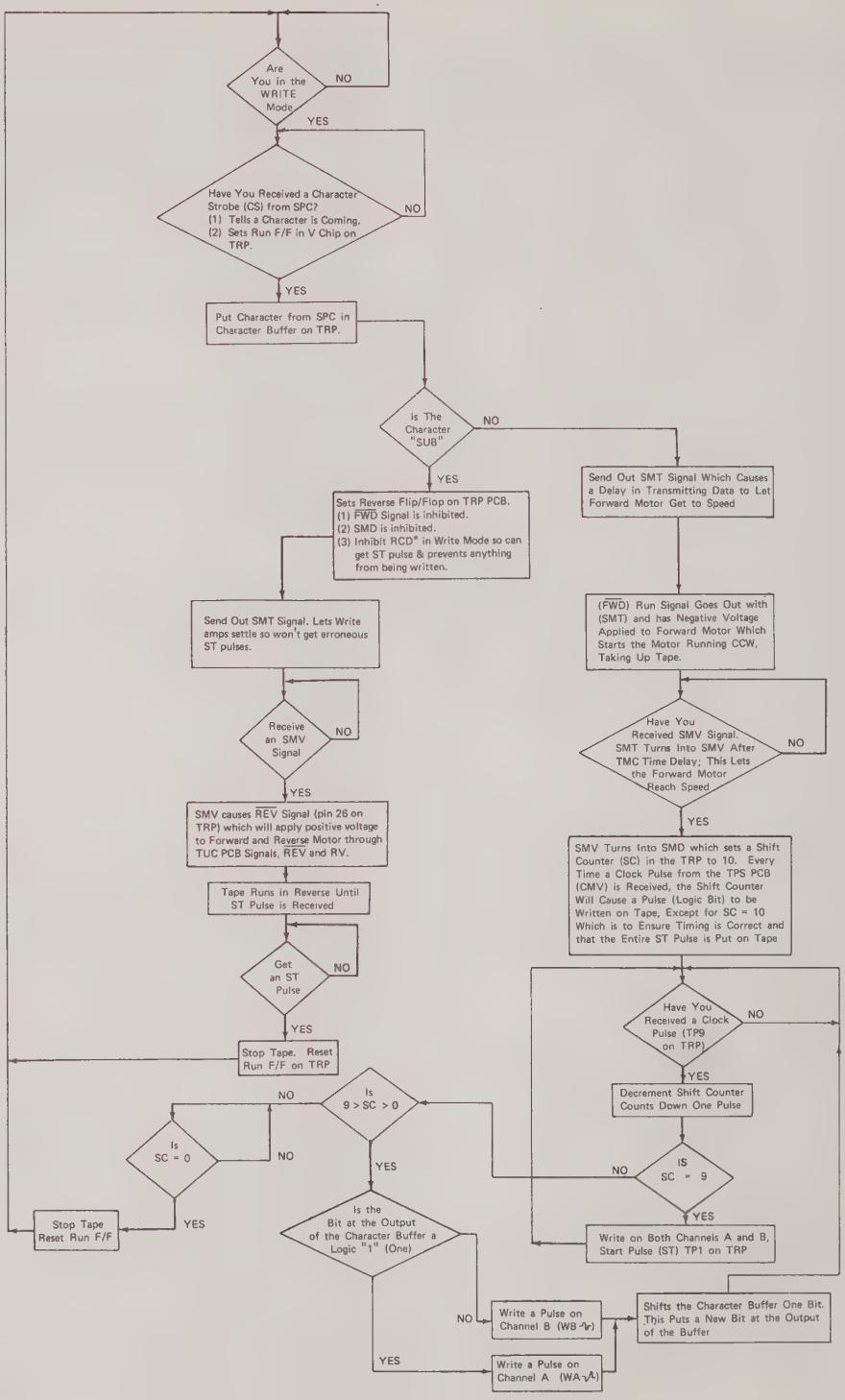
The Start multivibrator provides the necessary time delay to allow the tape to get up to correct speed before a character is written. It also controls when a character is dumped out of V chip on the TRP PCB to be written on tape, and causes correct character spacing during write.

FUNCTIONAL FLOW DIAGRAMS

Figures 3-9 and 3-10 are functional flow diagrams of the "Write" and "Read" sequences of operation. Most of the logical decision (control) circuits shown on these diagrams are in the V chip of the TRP Printed Circuit Board. These diagrams, along with the Elementary Drawings in Chapter IV, should assist you in understanding how the TCA operates.

NOTE

The diamond symbol represents a logical decision. A line from the bottom of the diamond indicates a "Yes" of the Function (question) called out within the diamond. A line from the side indicates a "No".


Are You in the WRITE Mode
NO
YES
Have You Received a Character Strobe (CS) from SPC?
(1) Tells a Character is Coming.
(2) Sets Run F/F in V Chip on TRP.
NO
YES
Put Character from SPC in Character Buffer on TRP.
Is The Character "SUB"
NO
YES
Sets Reverse Flip/Flop on TRP PCB.
(1) FWD Signal is inhibited.
(2) SMD is inhibited.
(3) Inhibit RCD* in Write Mode so can get ST pulse & prevents anything from being written.
Send Out SMT Signal. Lets Write amps settle so won't get erroneous ST pulses.
Receive an SMV Signal
NO
YES
SMV causes REV Signal (pin 26 on TRP) which will apply positive voltage to Forward and Reverse Motor through TUC PCB Signals, REV and RV.
Tape Runs in Reverse Until ST Pulse is Received
Get an ST Pulse
NO
YES
Stop Tape. Reset Run F/F on TRP
Is 9 > SC > 0
NO
Is SC = 0
NO
YES
Stop Tape Reset Run F/F
YES
Is the Bit at the Output of the Character Buffer a Logic "1" (One)
NO
Write a Pulse on Channel B (WB)
YES
Write a Pulse on Channel A (WA)
Shifts the Character Buffer One Bit. This Puts a New Bit at the Output of the Buffer
Send Out SMT Signal Which Causes a Delay in Transmitting Data to Let Forward Motor Get to Speed
(FWD) Run Signal Goes Out with (SMT) and has Negative Voltage Applied to Forward Motor Which Starts the Motor Running CCW, Taking Up Tape.
Have You Received SMV Signal. SMT Turns Into SMV After TMC Time Delay; This Lets the Forward Motor Reach Speed
NO
YES
SMV Turns Into SMD which sets a Shift Counter (SC) in the TRP to 10. Every Time a Clock Pulse from the TPS PCB (CMV) is Received, the Shift Counter Will Cause a Pulse (Logic Bit) to be Written on Tape, Except for SC = 10 Which is to Ensure Timing is Correct and that the Entire ST Pulse is Put on Tape
Have You Received a Clock Pulse (TP9 on TRP)
NO
YES
Decrement Shift Counter Counts Down One Pulse
IS SC = 9
NO
YES
Write on Both Channels A and B, Start Pulse (ST) TP1 on TRP

TCA-4050

Figure 3-9. Functional Flow Diagram of Write Sequence of Operation

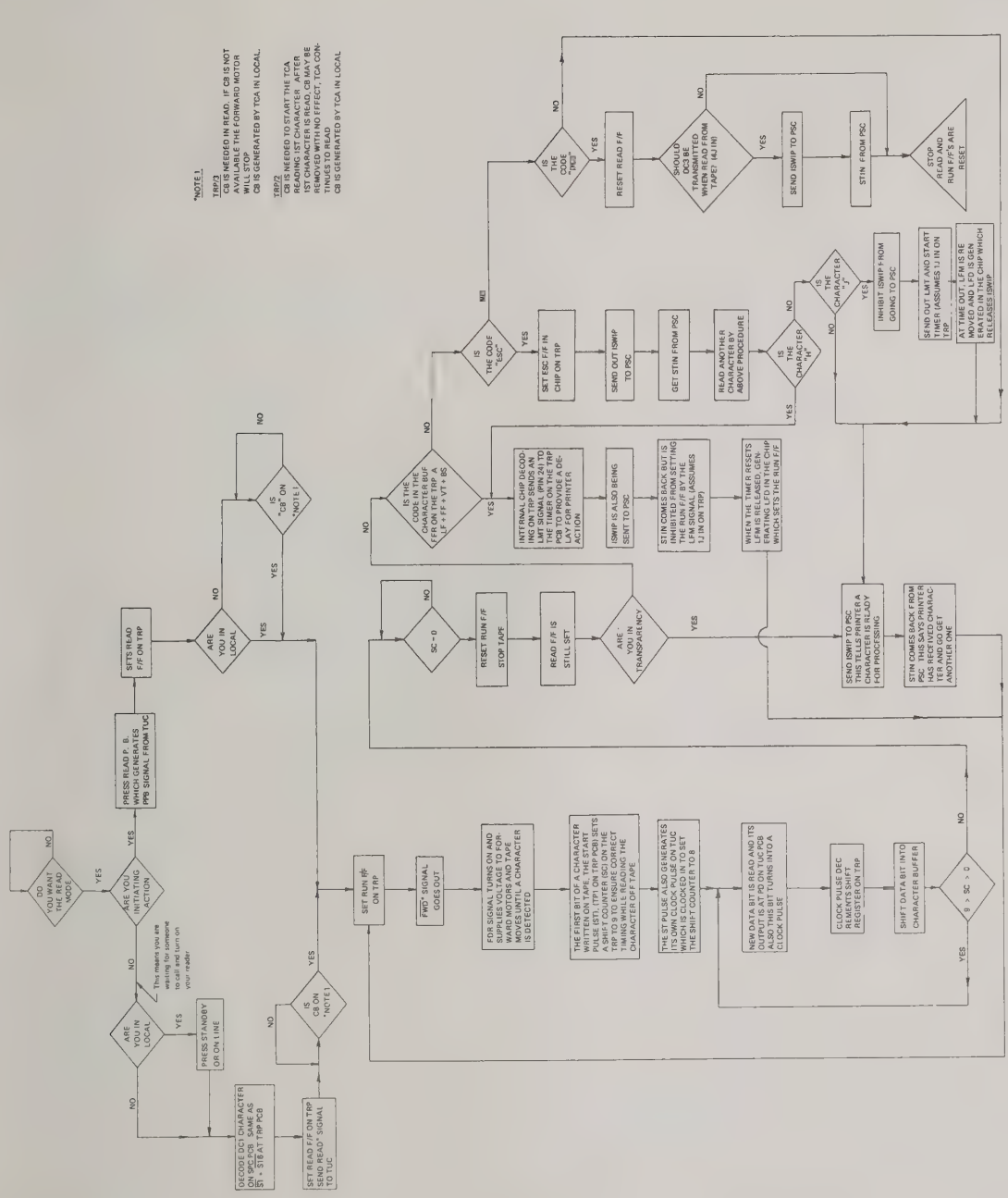

DO YOU WANT THE READ MODE
ARE YOU INITIATING ACTION
This means you are ready to receive a call and turn on your reader
ARE YOU IN LOCAL
PRESS STANDBY OR ON LINE
DECODE DCI CHARACTER ON SPC PCB SAME AS S1 + S1B AT TRP PCB
SET READ F/F ON TRP SEND "READ" SIGNAL TO TUC
IS CB ON *NOTE 1
PRESS READ P. B. WHICH GENERATES PPB SIGNAL FROM TUC
SETS READ F/F ON TRP
ARE YOU IN LOCAL
IS "CB" ON *NOTE 1
SET RUN F/F ON TRP
"FWD" SIGNAL GOES OUT
FOR SIGNAL TURNS ON AND SUPPLIES VOLTAGE TO FORWARD MOTORS AND TAPE MOVES UNTIL A CHARACTER IS SET IN FIFO
THE FIRST BIT OF A CHARACTER WRITTEN ON TAPE, THE START PULSE FROM THE FIFO RESETS A SHIFT COUNTER (SC) ON THE TRP TO 9 TO ENSURE CORRECT TIMING WHILE READING THE CHARACTER OFF TAPE
THE ST PULSE ALSO GENERATES ITS OWN CLOCK PULSE FROM TUC WHICH IS USED TO SET THE SHIFT COUNTER TO 8
NEW DATA BIT IS READ AND ITS CONTENT IS STORED IN PCB ALSO THIS BIT TURNS INTO A CLOCK PULSE
CLOCK PULSE DECREMENTS SHIFT REGISTER ON TRP
SHIFT DATA BIT INTO CHARACTER BUFFER
8 > SC > 0
SC = 0
RESET RUN F/F STOP TAPE
READ F/F IS STILL SET
ARE YOU IN TRANSPARENCY
IS THE CODE IN THE CHARACTER BUFFER (FFR ON THE TRP A (F + FF + VT + BS
INTERNAL CHIP DECODING ON TRP SENDS AN INTERNAL "ESC" AND THE TIMER ON THE TRP PCB TO PROVIDE A DELAY FOR THE PRINTER ACTION
ISWIP IS ALSO BEING SENT TO PSC
STIN COMES BACK BUT IS IGNORED DUE TO SETTING THE BUFFER FULL BY LFM SIGNAL (ASSUMES 1J IN ON TRP)
WHEN THE TIMER RESETS LFM IS RELEASED, GENERATING LFD IN THE CHIP WHICH SETS THE RDA F/F
SEND ISWIP TO PSC THIS TELLS PRINTER A CHARACTER IS READY FOR PROCESSING
STIN COMES BACK FROM PSC THIS SAYS PRINTER HAS SENT BACK CHARACTER AND GO GET ANOTHER ONE
IS THE CODE "ESC"
SET ESC F/F IN CHIP ON TRP
SEND OUT ISWIP TO PSC
GET STIN FROM PSC
READ ANOTHER CHARACTER BY ABOVE PROCEDURE
IS THE CHARACTER "H"
IS THE CHARACTER "J"
INHIBIT ISWIP FROM GOING TO PSC
SEND OUT LMT AND START TIMER (ASSUMES 1J IN ON TRP
AT TIME OUT, LFM IS RELEASED AND LMT IS RESET IN THE CHIP WHICH RELEASES ISWIP
IS THE CODE "HOME"
RESET READ F/F
SHOULD DATA BE TRANSMITTED WHEN READ FROM TAPE? (4J IN)
SEND ISWIP TO PSC
STIN FROM PSC
STOP READ AND RUN F/F'S ARE RESET
*NOTE 1.
TRP/3
CB IS NEEDED IN READ. IF CB IS NOT AVAILABLE THE FORWARD MOTOR WILL STOP.
CB IS GENERATED BY TCA IN LOCAL.
TRP/2
CB IS NEEDED TO START THE TCA READING CHARACTERS AFTER 1ST CHARACTER IS READ. CB MAY BE REMOVED WITH NO EFFECT. TCA CONTINUES TO READ
CB IS GENERATED BY TCA IN LOCAL
TCA-4051

Figure 3-10. Functional Flow Diagram of Read Sequence of Operation

CHAPTER IV

TROUBLESHOOTING

SECTION 1

TROUBLESHOOTING GUIDE

Before using the following guide, determine the problem and what functions are operating correctly. Find the description that best describes your problem in the left hand column. Across from the problem description you will find a possible cause or causes.

PROBLEM	POSSIBLE CAUSE
No power indication of any kind.	1. No cassette in door or door not closed.
	2. Cassette not properly aligned in door.
	3. Printer not turned on.
	4. TCA power cord not plugged into TCA or wall receptacle.
	5. Wall receptacle not on.
	6. Interconnection cable between Printer and TCA is loose or not connected.
	7. Fuse blown or loose on TLP PCB.
	8. Loose connectors on TPS PCB.
	9. Defective "Cassette Present" switch.
	10. 0 volt bus from Printer open on Printer mother board.
Low or improper bus voltages.	1. Defective TPS PCB.
	2. Loose wire or connector on TPS PCB.
	3. Defective power transistors. Q1 (+15V) Q2 (-15V) on heat sink at rear of TCA.
	4. Short or open chokes L1 or L2 (1.2 ohm).
Relay on TLP PCB not energized when door is closed with cassette present.	1. Cassette not seated properly.
	2. Defective relay drive circuit on TPS PCB.
	3. TPS PCB bus levels not correct.
	4. Defective "Cassette Present" switch.
	5. Defective wire harness or open relay winding.

Continued

PROBLEM	POSSIBLE CAUSE
Forward motor shaft turns while reading but cassette hub does not.	1. Forward motor solenoid not energized. 2. Forward motor mounting bracket spring not forcing motor shaft on rubber rimmed drive wheel. 3. Forward motor partially shorted. See Note 3 at end of Troubleshooting Guide. 4. Shipping strap still in.
Tape runs uncontrollably when power is brought up.	1. TCA to Printer cable connectors not properly seated. 2. TRP PCB not seated properly. 3. TRP PCB is not in Printer R&P slot. 4. Defective TRP PCB. 5. Shipping strap still attached. 6. TMC potentiometer P1 or PCB.
Tape mangled or reels not running smoothly.	1. Tape binding in cassette. Try new cassette. 2. Forward motor slipping on drive wheel. 3. Check forward motor bearing for drag. See Note 1. 4. Check for loose spindle on reverse motor. 5. Check forward and reverse motor for shorts. See Note 2.
Lamp will not light in pushbutton.	1. Lamp burned out. 2. Lamp improperly seated in socket. 3. Open wiring. 4. Lamp driver on TUC PCB.
Power drops when ADVANCE pushbutton is pressed. (All pushbutton lamps go out and the relay on TLP PCB de-energizes.)	1. Defective TPS PCB. 2. Defective TMC PCB (advance circuit). 3. Defective forward motor in tape deck. Check for short (see Note 2). 4. +15V or -15V short in TCA.

Continued

PROBLEM	POSSIBLE CAUSE
Power drops when BLOCK REWIND pushbutton is pressed (all pushbutton lamps go out and the relay on TLP PCB de-energizes).	1. Defective TPS PCB. 2. Defective forward motor in tape deck. Check for short (see Note 2). 3. Defective reverse motor. Check for short (see Note 2). 4. +15V or -15V short in TCA.
Occasional garble.	1. Defective cassette. Try new cassette. 2. Dirty tape head. 3. Defective TRP or TUC PCB.
Garble	1. Defective TRP PCB. 2. Wrong strapping on TRP PCB (see Chapter II). 3. Defective TPS PCB. 4. Trying to record at 1200 baud rate from keyboard.
Missing first character only while reading block of data which was written at 1200 baud rate.	Fill characters were not used while writing on tape. See Chapter III, Section 1.
TCA does not recognize clear leader.	1. Defective TPS PCB. 2. Defective TUC PCB. 3. Photocell lamp burned out in deck. 4. Defective tape deck. 5. 5V AC missing from tape deck Pin 7.
Will not read.	1. Loose plug on tape deck. 2. Defective TRP PCB. 3. Defective TPS PCB. 4. Defective TUC PCB. 5. Defective tape deck. 6. No READY light (CB) in ON LINE or STANDBY.
TCA will write but will not read.	1. Printer switches improperly set. 2. TRP PCB strapping incorrect.

PROBLEM	POSSIBLE CAUSE
TCA will write but will not read (Continued)	3. Defective TRP PCB.
	4. Defective TMC PCB (tape does not move).
	5. Defective PSC (Printer bustle).
Will not write.	1. Loose plug on tape deck.
	2. Defective TRP PCB.
	3. Defective TUC PCB.
	4. Defective TMC PCB.
	5. Defective tape deck.
	6. Defective SPC (Printer bustle).
TCA will read data but will not write.	1. Printer switches improperly set.
	2. "Write Enable" tab on cassette is removed.
	3. Defective TRP PCB.
	4. Defective "Write Enable" switch in tape deck.
	5. Defective TUC PCB.
	6. Defective TMC PCB (tape does not move).
	7. Defective SPC (Printer bustle).
Rewind or Block Rewind will not function.	1. Defective TUC, TPS, or TRP PCB's.
	2. Motor or Solenoid defective.
BLOCK REWIND pushbutton stays on when magnetic tape is over photocell.	1. Defective tape deck photocell.

TROUBLESHOOTING NOTES

1. Check forward motor bearings for drag as follows:

   a. Open door and remove cassette.

   b. Grasp forward motor spindle shaft lightly; and rotate very slowly. If a slight resistance is felt in spots, the motor bearings should be cleaned and oiled as follows (the motors in later model tape decks that have two fiber washers on the forward shaft should not require cleaning).

   c. Remove snap ring and push the splined shaft through the bearing.

   d. Use a cotton swab and clean out inside of bearing.

   e. Apply one drop of light machine oil and reassemble.

2. Check forward and reverse motor for shorts as follows:

   a. Remove connector directly under the two motors.

b. Place ohmmeter between either one of the two motor leads and the frame of the motor. Use 1K or 10K ohm scale.

c. Hold motor shaft and rotate very slowly in clockwise direction. While rotating, push and pull shaft lightly in and out.

d. Watch for a deflection of the meter. If deflection occurs, motor is bad.

3. Measure resistance of motor windings as follows:

a. Remove connector directly under the two motors.

b. Place ohmmeter on X1 scale. Short meter leads and zero the meter.

c. Connect meter leads to motor.

d. Hold motor shaft so that it will not rotate.

e. A1 Models - Forward motor should be about 9.4 ohms. Reverse motor should be about 18 ohms.

A2/A3 Models - Both motors should be about 9.4 ohms. (All values are ±15%.)

4. When having problems with Advance, Read, or Block Rewind, take voltage readings at FDR P8-Pin 12 (TUC PCB) as follows:

a. With ADVANCE pushbutton pressed, FDR should be -15V with respect to ground.

b. When reading blank tape at 10, 15, or 30 characters, FDR should be about -2.6V with respect to ground.

c. When reading blank tape at 120 characters, FDR should be about -7V with respect to ground.

d. When in Block Rewind through blank tape, FDR should be about -15V with respect to ground.

5. When having speed problems with Block Rewind or Rewind, take voltage reading at REV MTR, P11-Pin 8 (TPS PCB) as follows:

a. During "Block Rewind", REV MTR should be +9V with respect to ground.

b. During "Rewind", REV MTR should be +10V with respect to ground.

6. If the forward motor creeps in a clockwise direction while the TCA is in the stopped condition, see Balance Pot Adjustment in Chapter V, Section 2.

7. If the tape rewinds to the beginning of tape when attempting a Block Rewind, check to see if the READ lamp will light. If the READ lamp is burned out, the TCA will not Block Rewind.

SECTION 2

DRAWINGS

The following drawings are supplied to assist you in troubleshooting the TCA if the problem cannot be solved with the Troubleshooting Guide. Also, it may be helpful to refer to the Functional Flow Diagrams in Chapter III, Section 2.

The drawings in this section reflect the use of the AMP* type connector at plugs P7 through P11. This type connector is brown in color and uses alpha and numeric characters to identify the connections.

Early A1 models of the TCA have Burndy type connectors at plugs P7 through P11 that are larger, green in color, and use numeric characters only to identify the connections. If you have the Burndy type connector, use the following cross reference chart.

AMP (BROWN) CONNECTOR	BURNDY (GREEN) CONNECTOR	AMP (BROWN) CONNECTOR	BURNDY (GREEN) CONNECTOR	AMP (BROWN) CONNECTOR	BURNDY (GREEN) CONNECTOR
1	1	13	25	J	16
2	3	14	27	K	18
3	5	15	29	L	20
4	7	16	31	M	22
5	9	17	33	N	24
6	11	A	2	P	26
7	13	B	4	R	28
8	15	C	6	S	30
9	17	D	8	T	32
10	19	E	10	U	34
11	21	F	12		
12	23	H	14		

*Tradename of Amp Incorporated

DEFINITIONS OF LOGIC SIGNALS

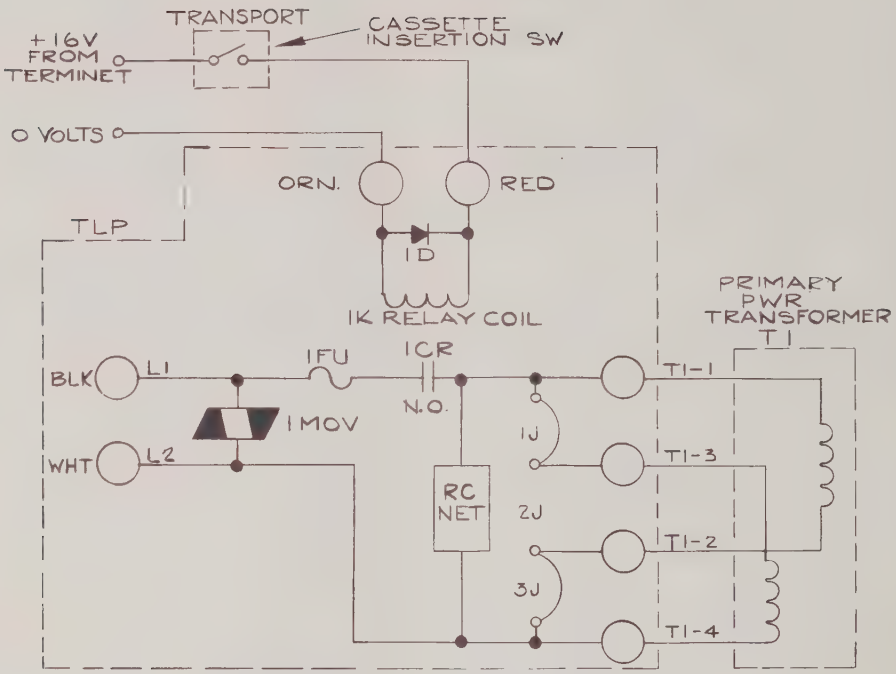
The following is a list of signal names and their definitions. This list includes most of the signal names shown in the elementary diagrams.

AMV	Write Advance Multivibrator
APB	Advance Pushbutton
B1 Thru B8	Buffer Register Stages 1 thru 8
CA	Channel A Output (Logic 1)
CB	Channel B Output (Logic 0)
CL	V Chip Clock
CLV	V Chip Low Voltage
CMV	Clock Multivibrator
CS	Machine Character Strobe
DD	End of Data
DL	Data Lamp
DLY	1200 Baud Delay
DWA	Deck Write Signal A (Logic 1)
DWB	Deck Write Signal B (Logic 0)
EHJ	Escape H or Escape J
EL	End of Tape Lamp
ESC	V Chip Escape Flip-Flop
ET	End of Tape
FDR	Forward Servo Reference
FWD	Forward
IPT	Read Transparency
ISWIP	Machine Input Strobe
LFD	Line Feed Delay Complete
LMT	Line Feed Multivibrator Trigger
LMV	Line Feed Multivibrator
LO	Cassette Accessory Lockout
LOK	Write Lockout
LV	Machine Low Voltage
PA	Logic 1 Signal
PB	Logic 0 Signal
PD	Play (Read) Data
POW	Tape Power On Signal
PPB	Read Pushbutton
PREA	Preamp A (Logic 1)

PREB	Preamp B (Logic 0)
PRE COM	Preamp Common
PTOF	Tape on Leader During Write (Machine Paper Tape Out Alarm)
RCD	Record (Write) Flip-Flop
RDY	Terminal Ready
READ	Read Flip-Flop
REV	Reverse
RFF	Reverse Flip-Flop
RLB	Rewind Lamp Button
RPB	Rewind Pushbutton Impulse
RS	Read Stop Flip-Flop
RS16	Received S16
RUN	Run Flip-Flop
RV	Reverse Drag Signal
RW	Rewind
RWB	Rewind Button
SC	Shift Counter Set
SC1 Thru 8	Shift Counter States 1 thru 8
SCD	Shift Complete (Character Complete)
SCL	Stop Read Time Out
SCS	Shift Counter between 0 and 9
SH	Shift Pulse
SL	Stop Lamp
SMT	Start Multivibrator Trigger
SMV	Start Multivibrator
SOL	Tape Deck Solenoid
SMD	Start Multivibrator Delay Complete
SPB	Stop Pushbutton
SR	Start Read
SRW	Start Rewind
ST	Start of Character
STIN	Machine Strobe In
TLR	Tape Control Unit Low Voltage
TLV	Tape Low Voltage
VTFFH	Machine Vertical Tab Hold
VTFFS	Machine Vertical Tab Stop
VTH	Vertical Tab Hold Flip-Flop
WA	Channel A Write Signal (Logic 1)
WB	Channel B Write Signal (Logic 0)
WCS	Write Character Strobe
WL	Write Lamp
WPB	Write Pushbutton
WREN	Write Enable
1200B	1200 Baud Operation

DRAWING INDEX

Figure 4-1	TLP	Printed Circuit Board	---	A1, A2, A3 and A4 Models
Figure 4-2	TRP/1	Printed Circuit Board	44C420203-G01	A1 Model
Figure 4-3	TRP/2	Printed Circuit Board	44C420203-G02	A2 and A4 Models
Figure 4-4	TRP/3	Printed Circuit Board	44C401224-G03	A3 Model
Figure 4-5	TPS/1	Printed Circuit Board	44C420202	A1 Model
Figure 4-6	TPS/2	Printed Circuit Board	---	A2, A3, and A4 Models
Figure 4-7	TUC/1	Printed Circuit Board	44D420301	A1 Model
Figure 4-8	TUC/2	Printed Circuit Board	---	A2, A3 and A4 Models
Figure 4-9	TMC/1	Printed Circuit Board	44C420201	A1 Model
Figure 4-10	TMC/2	Printed Circuit Board	---	A2, A3 and A4 Models
Figure 4-11	TCA DECK	Preamp	44C400175	A1, A2, A3 and A4 Models
Figure 4-12		Interconnection Diagram	44D420300, Sh. 1	A1 Model
Figure 4-13		Interconnection Diagram	44D420300, Sh. 3	A2, A3 and A4 Models
Figure 4-14		Interconnection Diagram	---	A1 Model
Figure 4-15		Interconnection Diagram	---	A2, A3 and A4 Models
Figure 4-16		TCA Cable	---	A1, A2, A3 and A4 Models
Figure 4-17		TCA Interconnection List	---	A1, A2, A3 and A4 Models



G01
120 VAC 50/60 HZ
1J, 3J IN ; 2J OUT
1FU = 1 AMP

G02
240 VAC 50/60 HZ
2J IN ; 1J, 3J OUT
1FU = 0.5 AMP

TCA-4006

Figure 4-1. TLP Printed Circuit Board - A1, A2, and A3 Models TCA

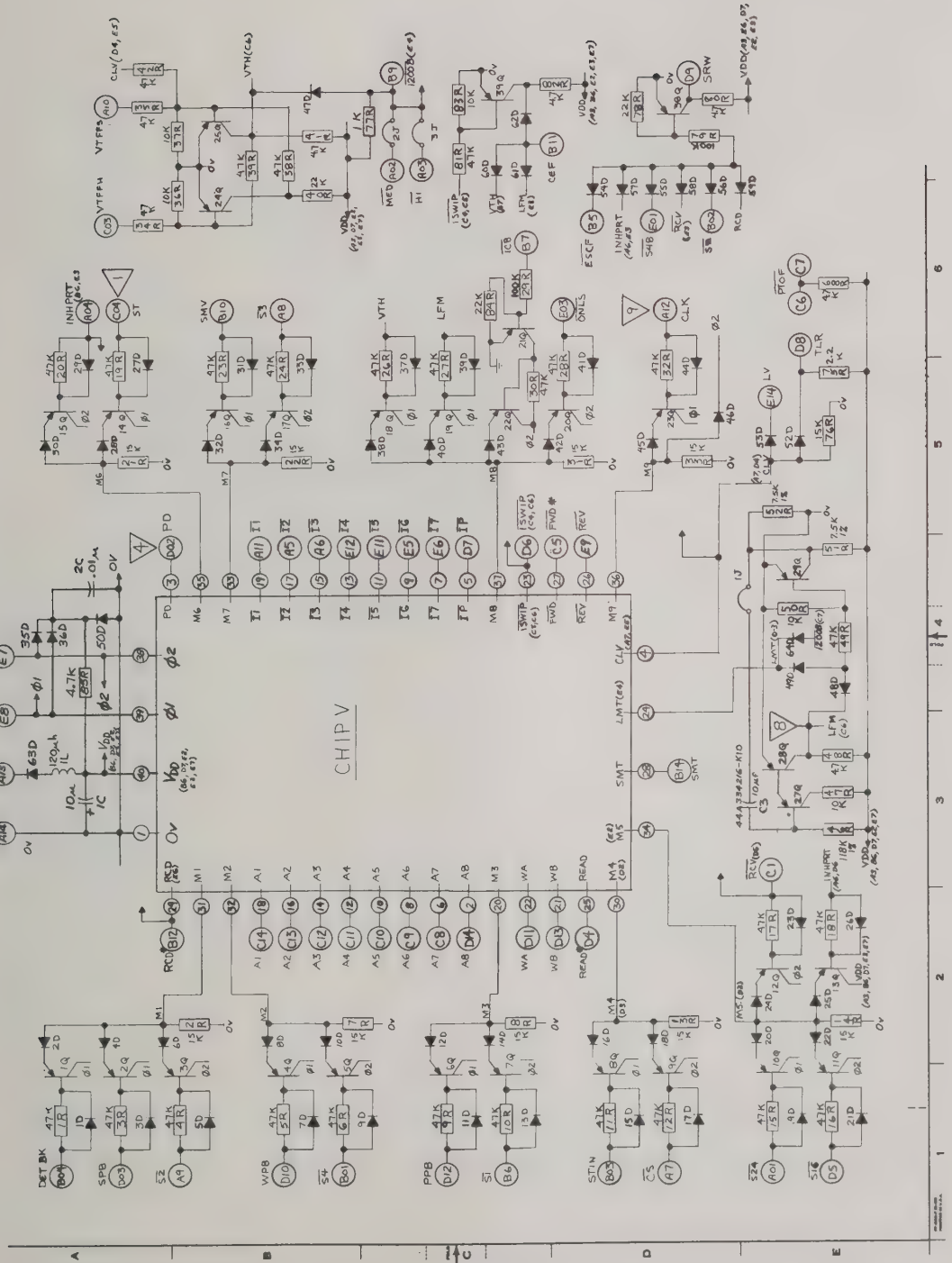


Figure 4-2. TRP/1 Printed Circuit Board (44C420203-G01, Rev. 3) - A1 Model TCA

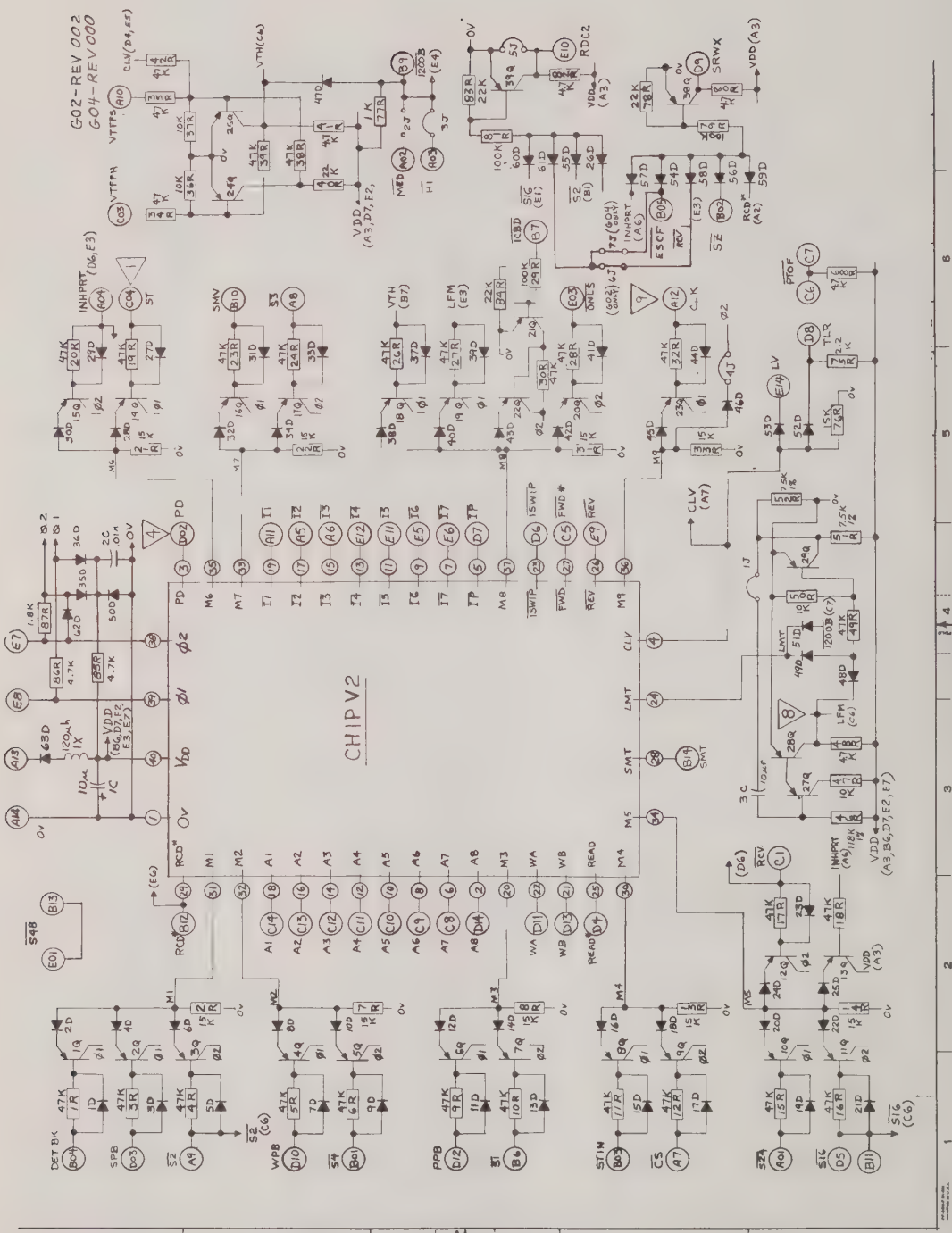


Figure 4-3. TRP/2 Printed Circuit Board (44C420203-G02, Rev. 2) - A2 Model TCA

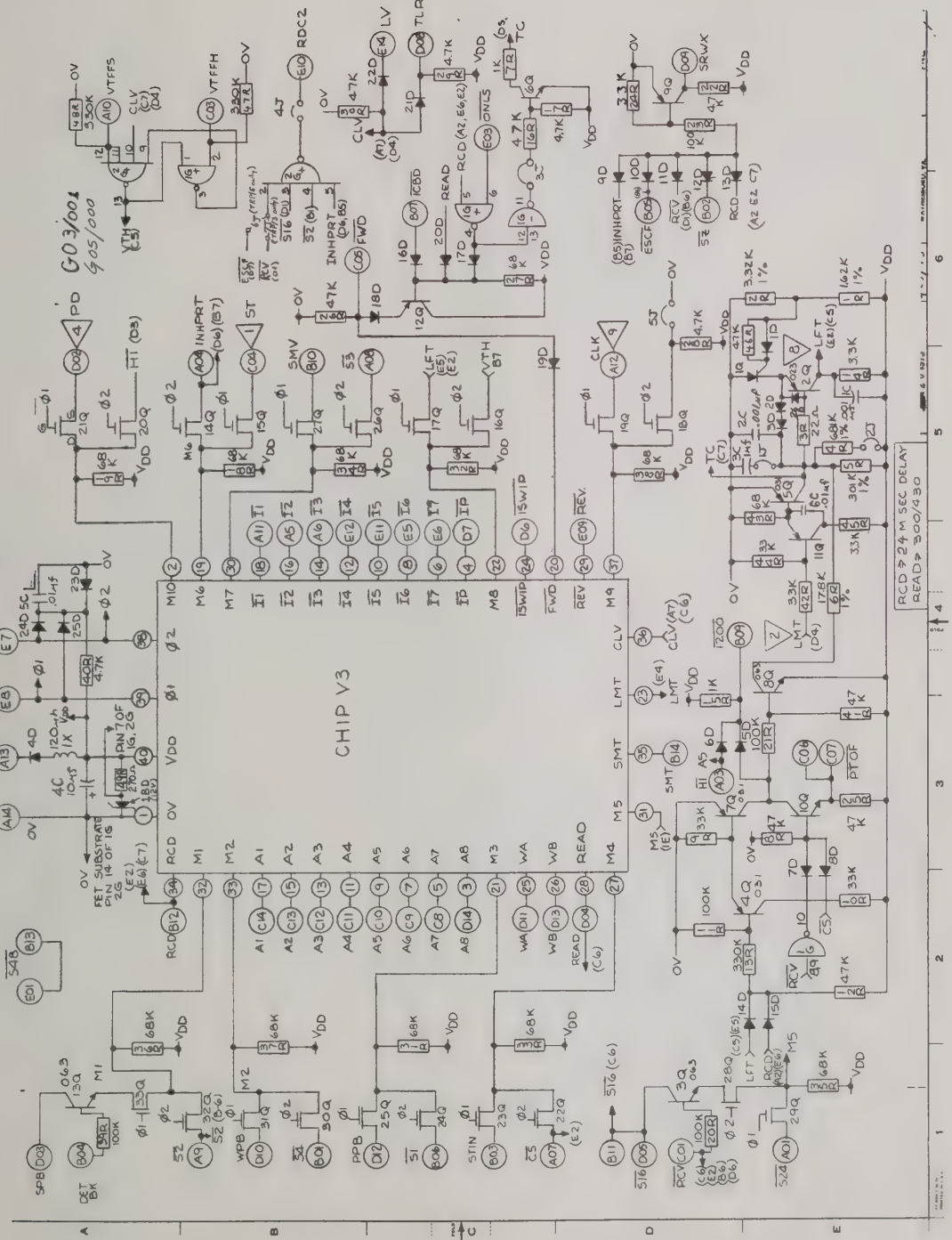


Figure 4-4. TRP/3 Printed Circuit Board (44C401224-G03, Rev. 2) - A3 Model TCA

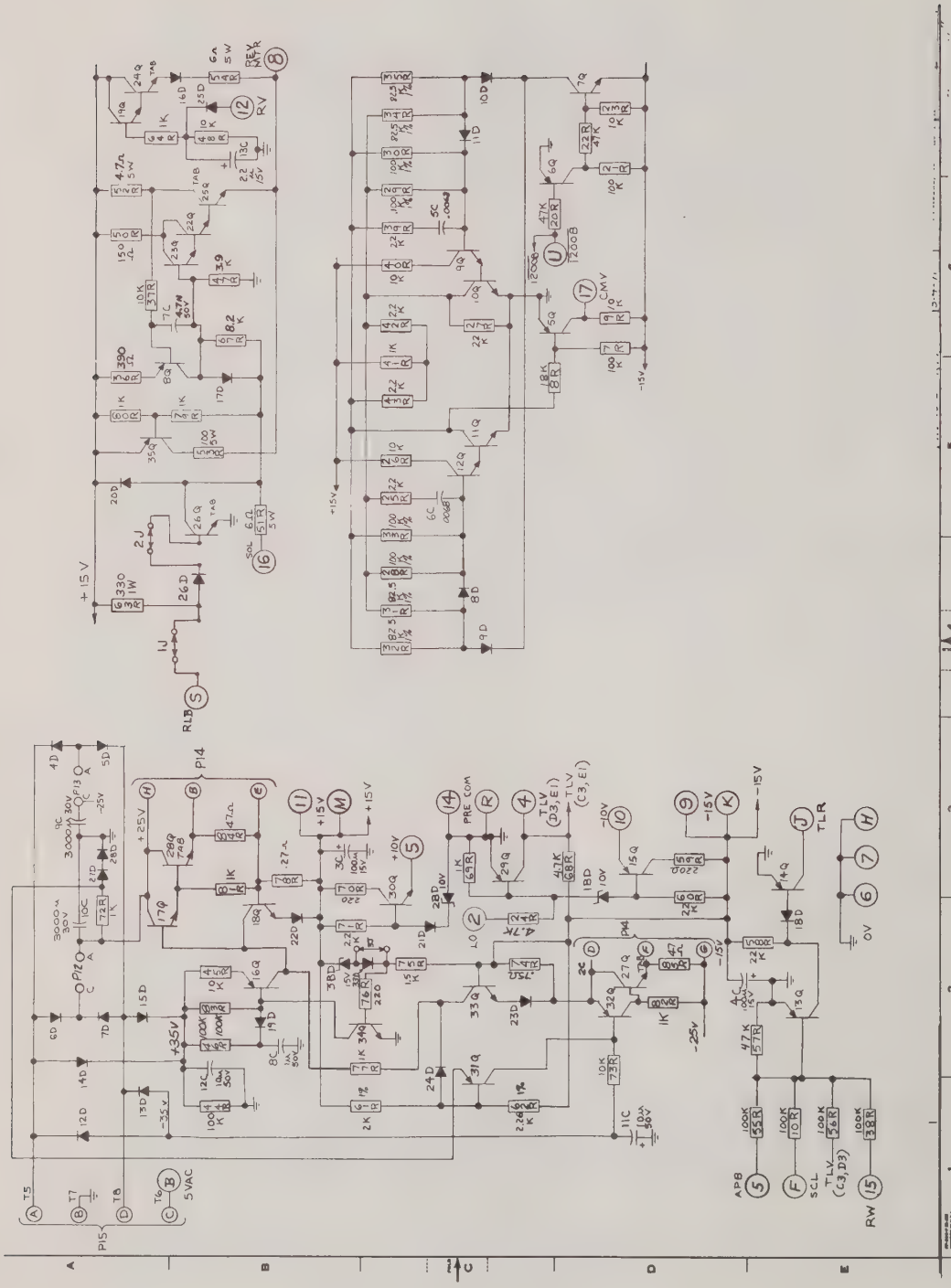


Figure 4-5. TPS/1 Printed Circuit Board (44C420202, Rev. 11) - A1 Model TCA

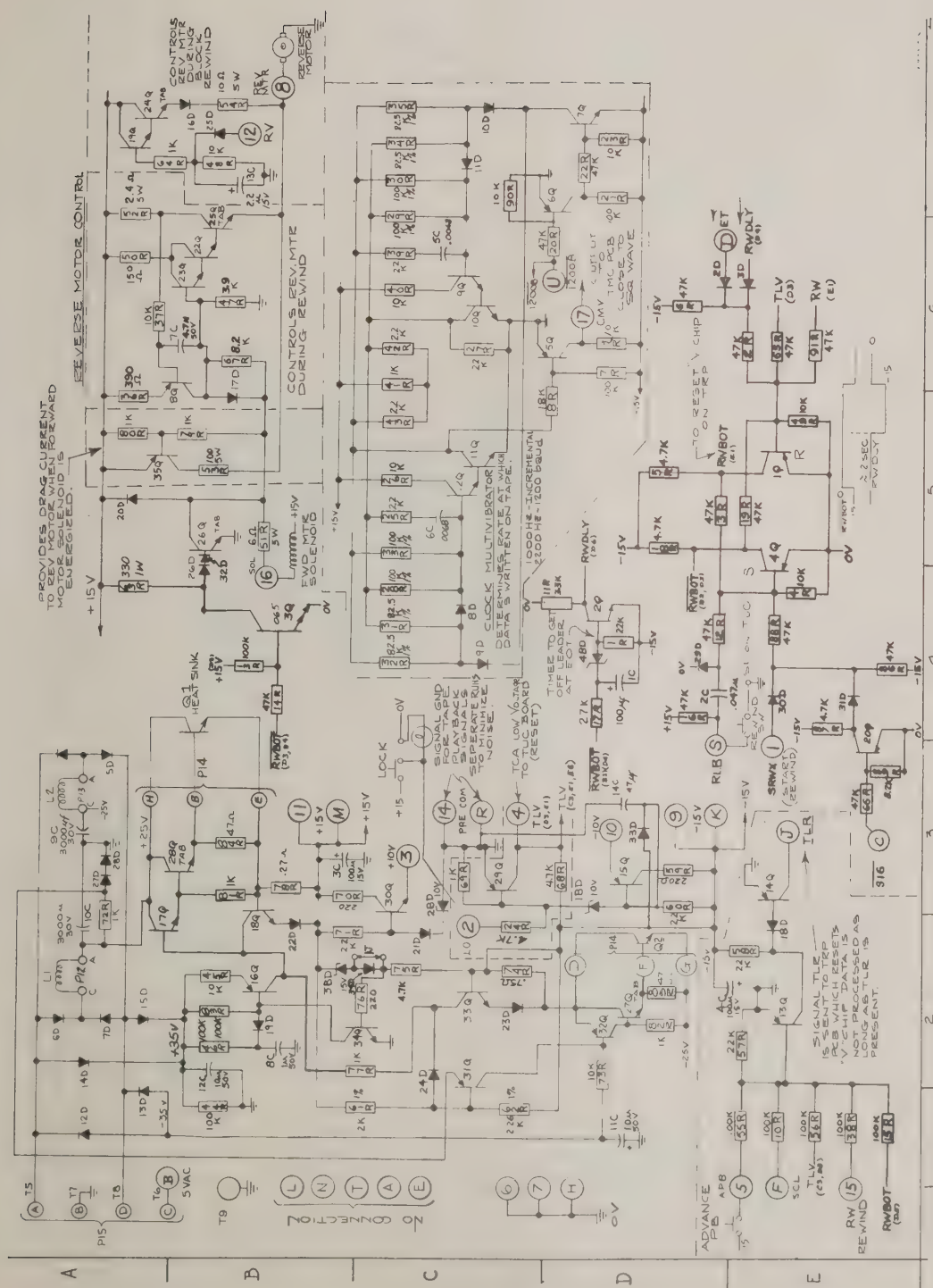

REVERSE MOTOR CONTROL
PROVIDES DRAG CURRENT TO REV MOTOR WHEN FORWARD MOTOR SOLENOID IS ENERGIZED.
CONTROLS REV MTR DURING REWIND
CONTROLS REV MTR DURING REWIND
REVERSE MOTOR
FWD MOTOR SOLENOID
CLOCK MULTIVIBRATOR DETERMINES RATE AT WHICH DATA IS WRITTEN ON TAPE.
1000HZ - INCREMENTAL 2200HZ - 1200 BAUD
TIMER TO GET OFF LEADER AT EOT
TCA LOW VOLTAGE TO TUC BOARD (RESET)
SIGNAL GND FOR TAPE SENSING SEPERATE RUN TO CHASSIS
TO RESET 'V' CHIP ON TCA
SIGNAL TLE IS SENT TO TRP PCB WHICH RESETS VOICE DATA IS NOT PROCESSED AS LONG AS TLE IS PRESENT.
ADVANCE PB
REWIND
TCA-4007

Figure 4-6. TPS/2 Printed Circuit Board - A2/A3 Models TCA

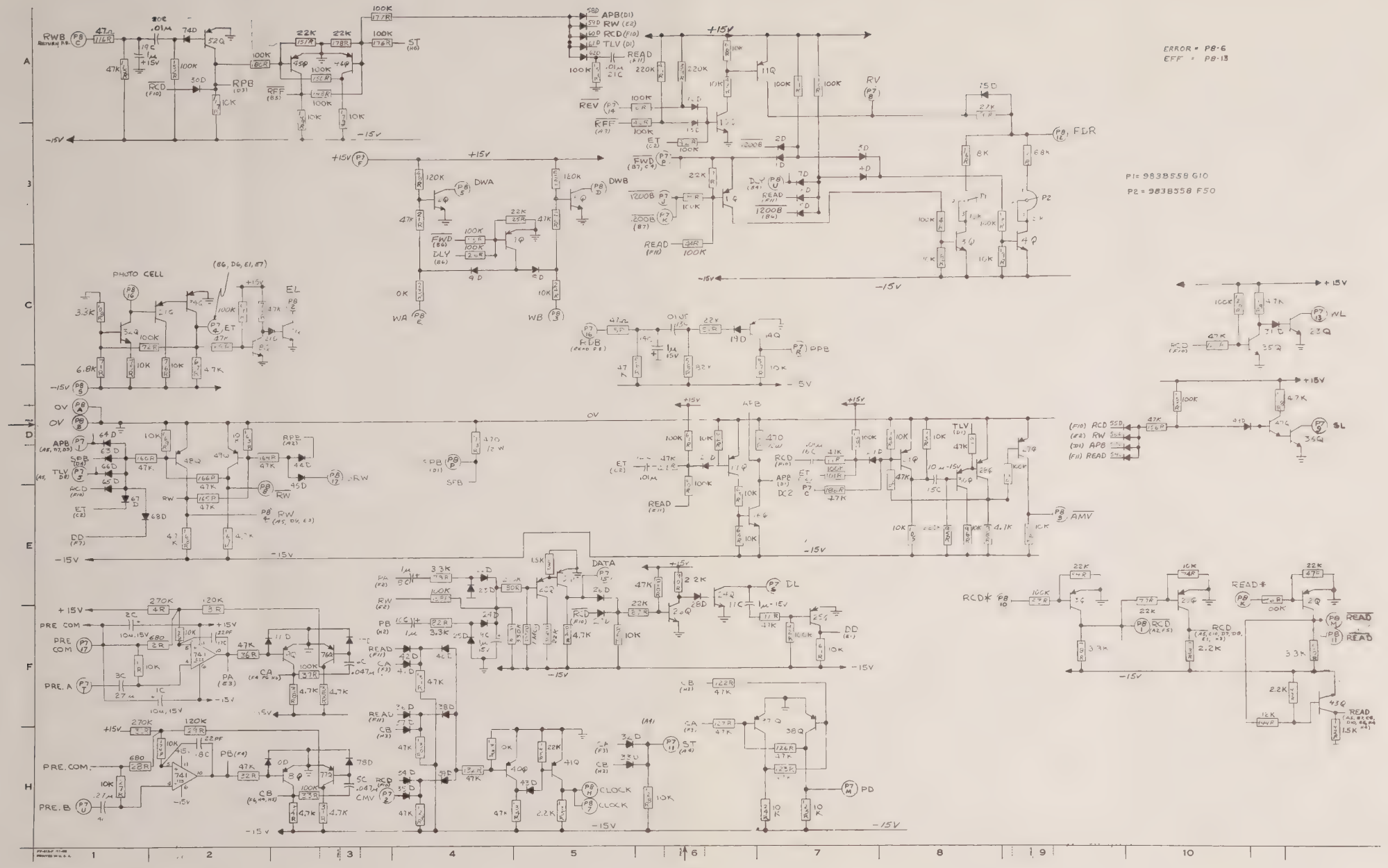


Figure 4-7. TUC/1 Printed Circuit Board (44D420301, Rev. 8) A1 Model TCA

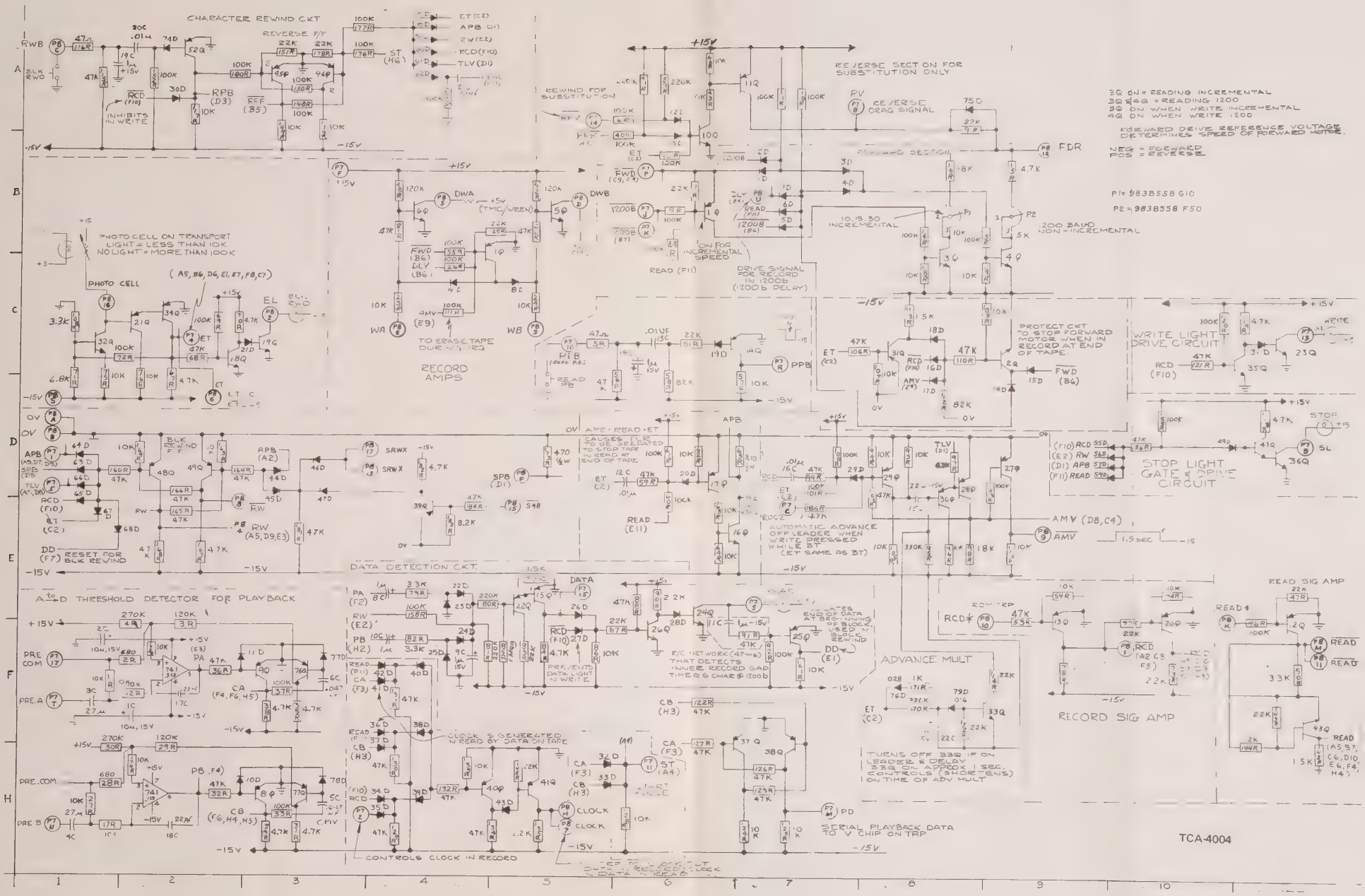

CHARACTER REWIND CKT
REVERSE F/F
INHIBITS IN WRITE
PHOTO CELL ON TRANSPORT
LIGHT = LESS THAN 10K
NO LIGHT = MORE THAN 100K
PHOTO CELL
RECORD AMPS
TO ERASE TAPE DUE N I RG
REWIND FOR SUBSTITUTION
REVERSE SECTION FOR SUBSTITUTION ONLY
REVERSE DRAG SIGNAL
FORWARD SECTION
10, 15, 30 INCREMENTAL
200 BAUD NON-INCREMENTAL
DRIVE SIGNAL FOR RECORD IN 1200b (1200b DELAY)
ON FOR INCREMENTAL SPEED
READ (F11)
PROTECT CKT TO STOP FORWARD MOTOR WHEN IN RECORD AT END OF TAPE.
WRITE LIGHT DRIVE CIRCUIT
STOP LIGHT GATE & DRIVE CIRCUIT
CAUSES FF TO BE RESET TO STOP TAPE IN READ AT END OF TAPE.
AUTOMATIC ADVANCE OFF LEADER WHEN WRITE PRESSED WHILE BT (ET SAME AS BT)
DATA DETECTION CKT.
A to D THRESHOLD DETECTOR FOR PLAYBACK
CLOCK IS GENERATED IN READ BY DATA ON TAPE
CONTROLS CLOCK IN RECORD
PREVENTS DATA LIGHT IN WRITE
F/C NETWORK (47 ms) THAT DETECTS INNER RECORD GAP TIMES 6 CHAR @ 1200 B
ADVANCE MULT
TURNS OFF BBQ IF ON LEADER & DELAY BBQ ON APPROX 1 SEC. CONTROLS (SHORTENS) ON TIME OF ADV MULT
RECORD SIG AMP
READ SIG AMP
SERIAL PLAYBACK DATA TO V CHIP ON TRP
TCA-4004

Figure 4-8. TUC/2 Printed Circuit Board A2 and A3 Models TCA

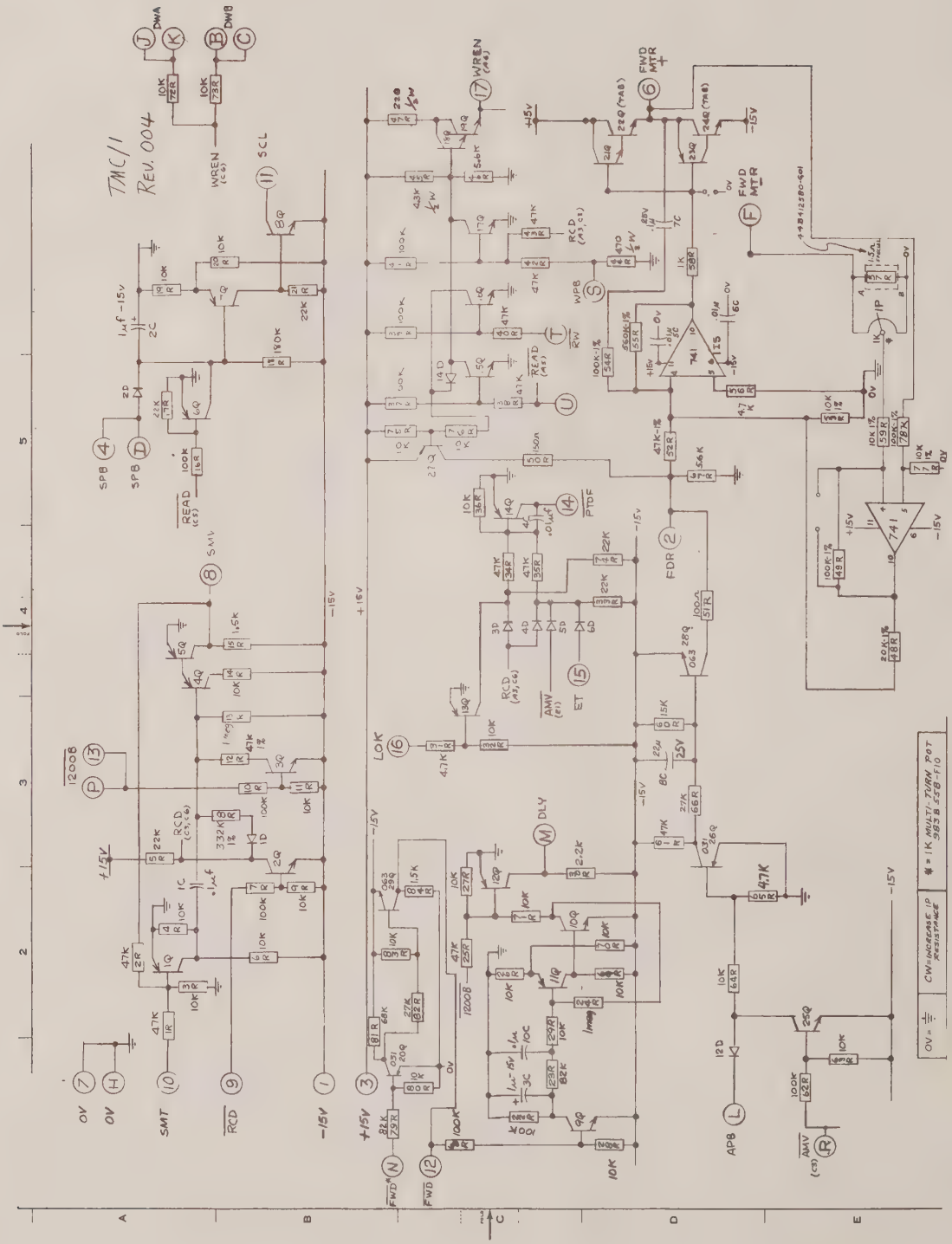


Figure 4-9. TMC/1 Printed Circuit Board (44C420201,Rev. 5) - A1 Model TCA

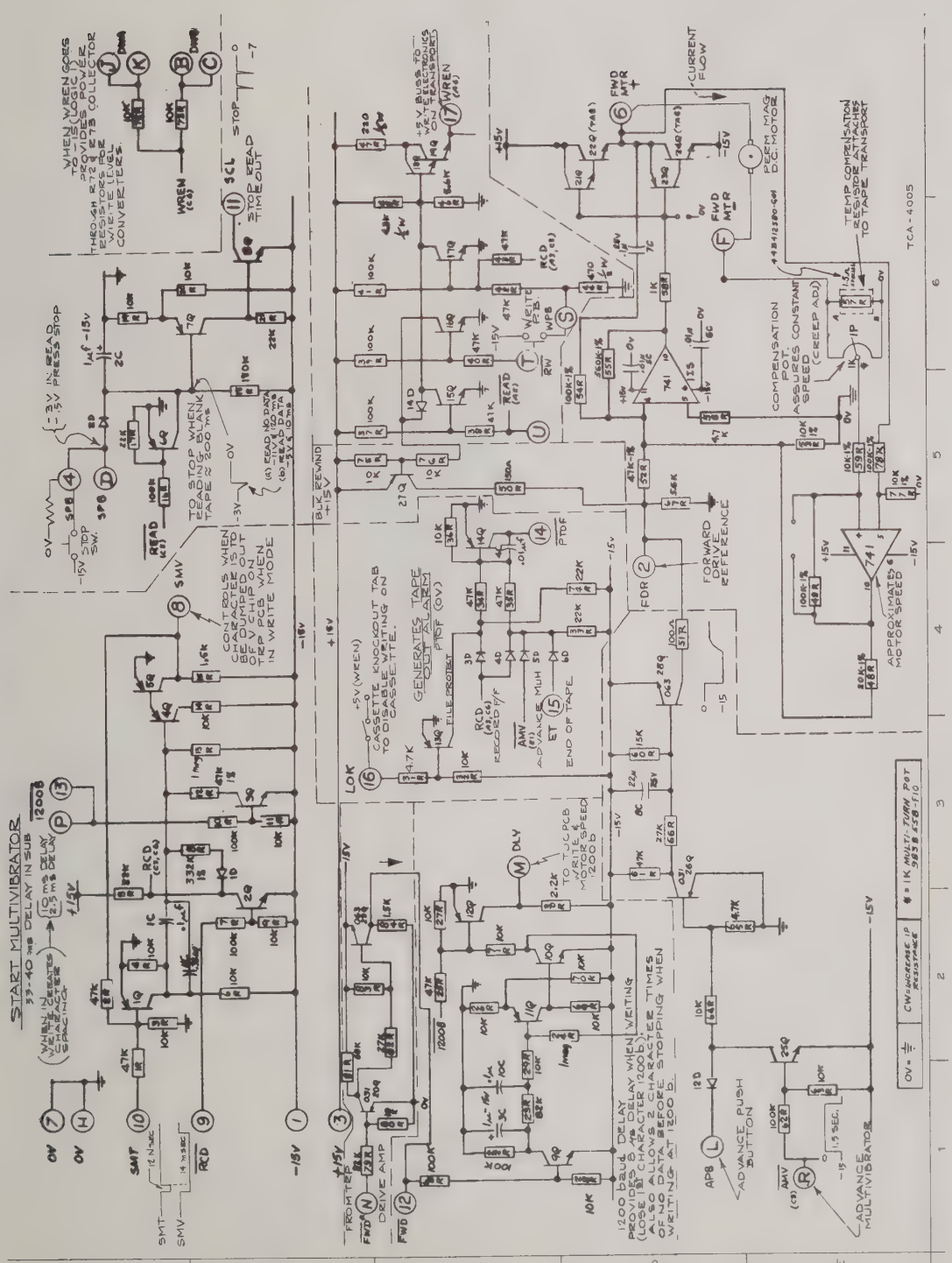


Figure 4-10. TMC/2 Printed Circuit Board - A2 and A3 Models TCA

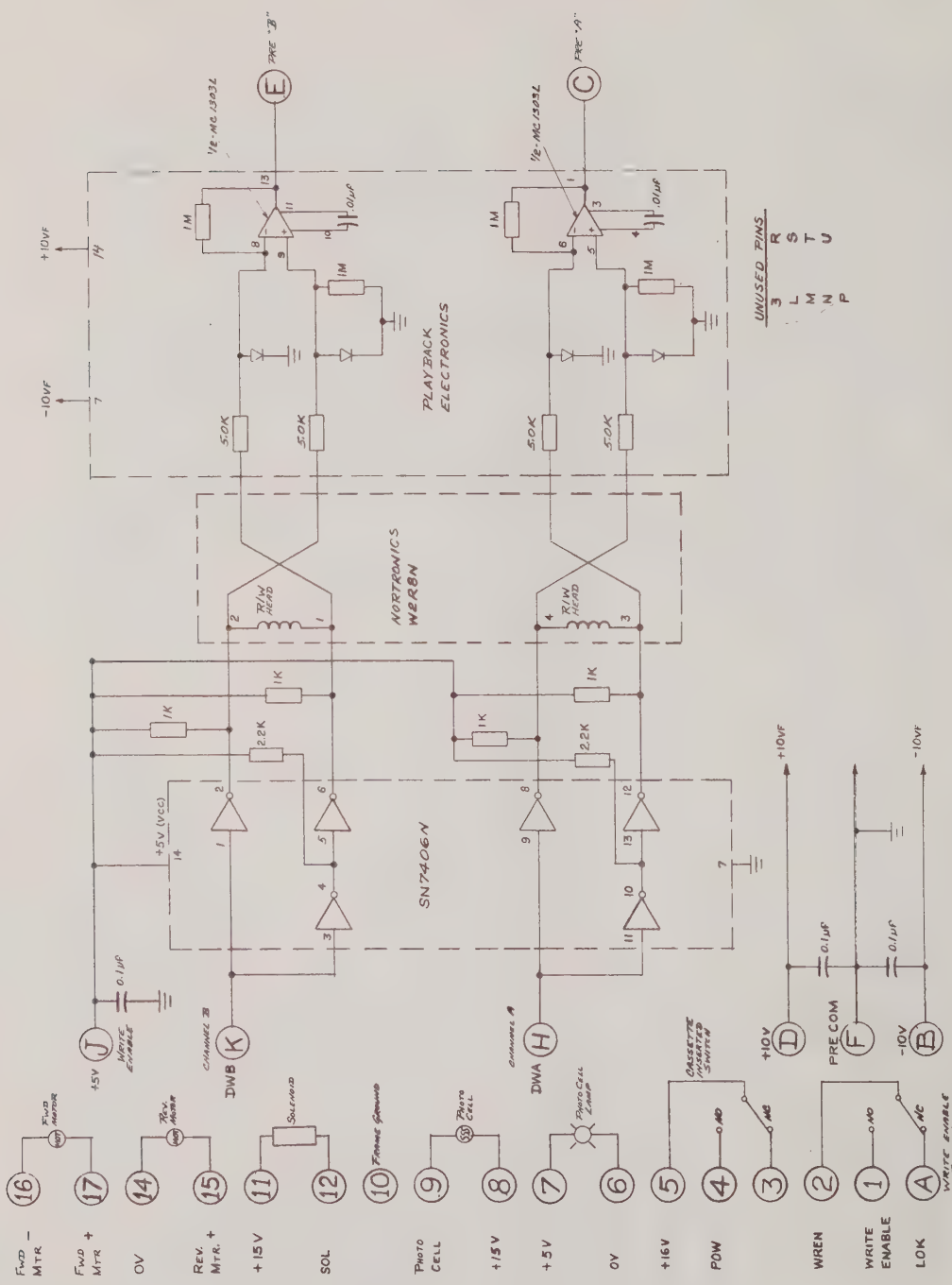
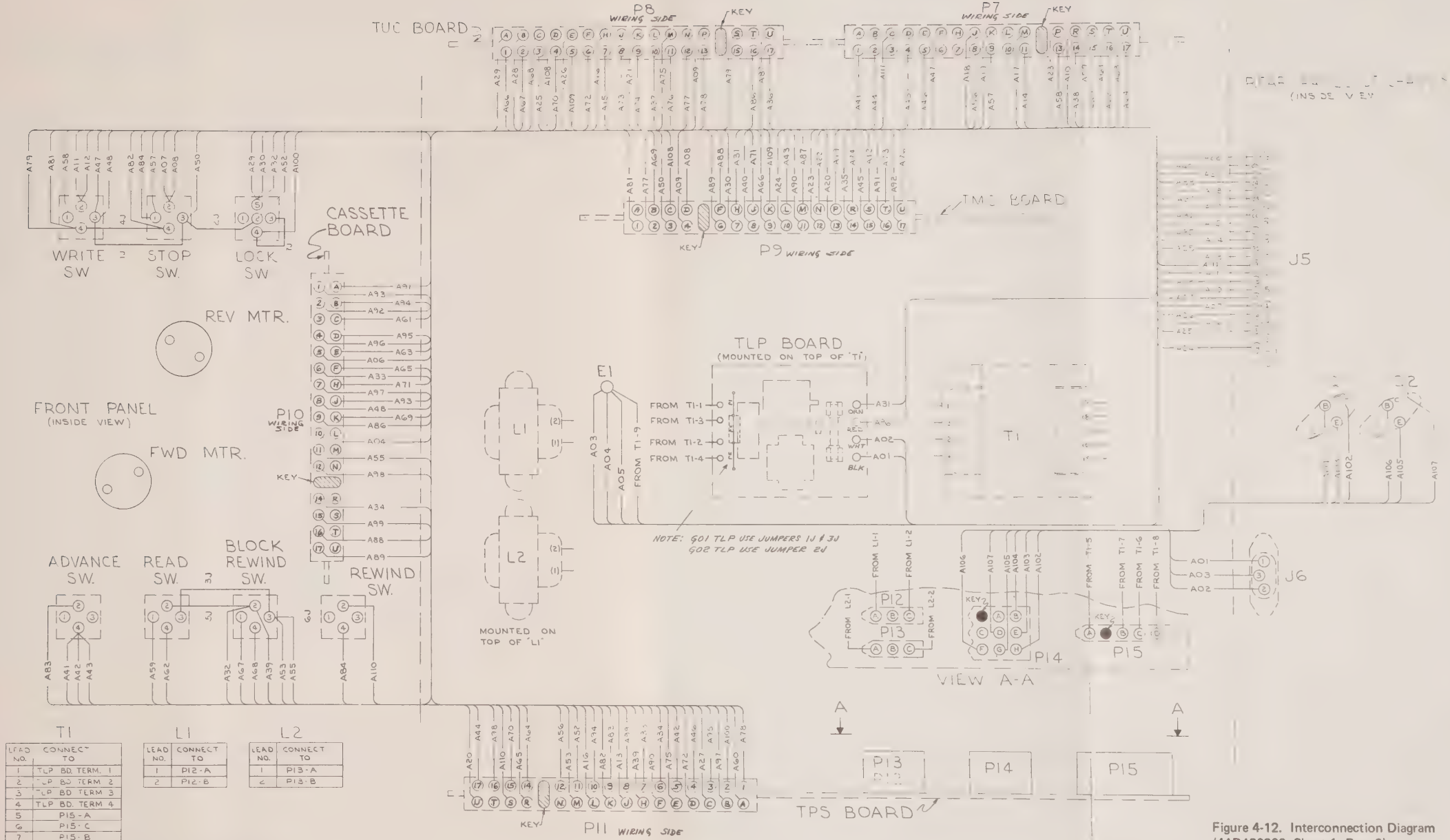


Figure 4-11. TCA Deck/Preamp (44C400175, Rev. 1) - A1, A2, and A3 Models TCA



T1

LEAD NO.	CONNECT TO
1	TLP BD. TERM. 1
2	TLP BD TERM 2
3	TLP BD TERM 3
4	TLP BD. TERM 4
5	P15-A
6	P15-C
7	P15-B
8	P15-D
9	E1

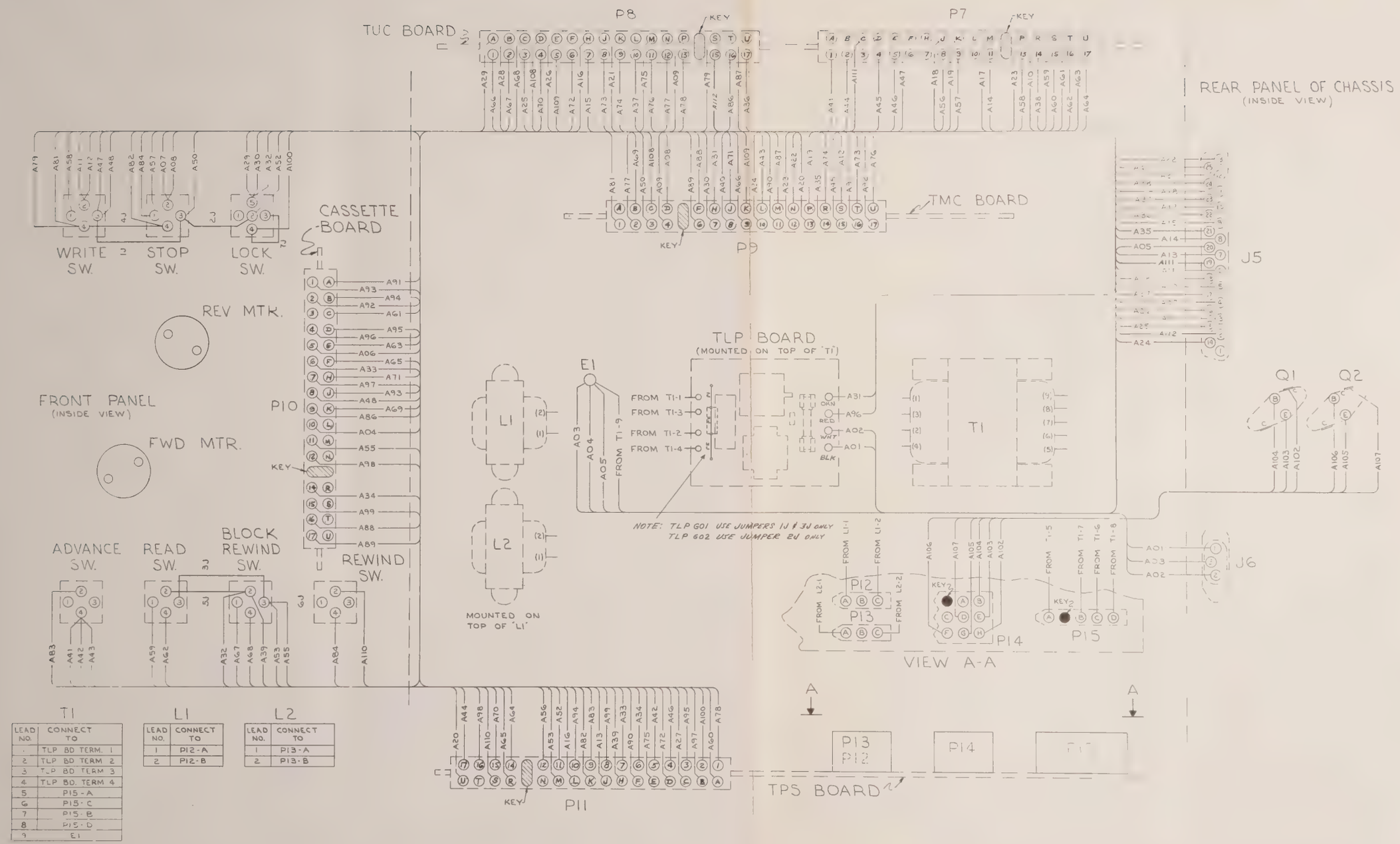
L1

LEAD NO.	CONNECT TO
1	P12-A
2	P12-B

L2

LEAD NO.	CONNECT TO
1	P13-A
2	P13-B

Figure 4-12. Interconnection Diagram (44D420300, Sheet 1, Rev. 6) A1 Model TCA



T1

LEAD NO.	CONNECT TO
.	TLP BD TERM. 1
2	TLP BD TERM 2
3	TLP BD TERM 3
4	TLP BD. TERM 4
5	P15 - A
6	P15 - C
7	P15 - B
8	P15 - D
9	E1

L1

LEAD NO.	CONNECT TO
1	P12 - A
2	P12 - B

L2

LEAD NO.	CONNECT TO
1	P13 - A
2	P13 - B

Figure 4-13. Interconnection Diagram
(44D420300, Sheet 3, Rev. 1)
A2/A3 Models TCA

WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A01	J6-1	TLP BD. TERM. BLK	18	BLK	L1
A02	J6-2	TLP BD. TERM. WHT	18	WHT	L2
A03	J6-3	E1	18	GRN	FRAME
A04	E1	P10-10	24	GRN	FRAME
A05	E1	J5-20	24	GRN	FRAME
A06	J5-3	P10-S	24		+16V
A07	J5-4	STOP SW. TERM. 2	24		SPB
A08	STOP SW. TERM. 2	P9-D	24		SPB
A09	P9-4	P8-P	24		SPB
A10	J5-5	P7-R	24		PPB
A11	J5-6	WRITE SW TERM. 2	24		WPB
A12	WRITE SW TERM. 2	P9-S	24		WPB
A13	J5-7	P11-J	24		TLR
A14	J5-8	P7-11	24		ST
A15	J5-9	P8-7	24		CLOCK
A16	P8-H	P11-L	24		CLOCK
A17	J5-10	P7-M	24		PD
A18	J5-11	P7-J	24		$\overline{200B}$
A19	P7-K	P9-P	24		$\overline{200B}$
A20	P9-13	P11-U	24		$\overline{200B}$
A21	J5-12	P8-K	24		READ #
A22	J5-13	P9-N	24		$\overline{FWD}$ #
A23	P9-12	P7-P	24		$\overline{FWD}$
A24	J5-14	P9-10	24		SMT
A25	J5-15	P8-3	24		WB
A26	J5-16	P8-E	24		WA
A27	J5-17	P11-C	24		CEF
A28	J5-18	P8-8	24		OV
A29	P8-A	LOCK SW. TERM. 5	24		OV
A30	LOCK SW TERM. 5	P9 7	24		OV
A31	P9-H	TLP BD TERM. ORN	24	ORN	OV
A32	LOCK SW TERM. 5	BLOCK REWIND SW TERM. 2	24		OV
A33	P11-7	P10-6	24		OV
A34	P11-6	P10-14	24		OV
A35	J5-21	P9-14	24		$\overline{PTOF}$
A36	J5-22	P8-17	24		SRW
A37	J5 23	P8-10	24		RCD#
A38	J5-24	P7-14	24		$\overline{REV}$
A39	BLOCK REWIND SW TERM. 2	P11-H	24		OV
A40	J5-25	P9-8	24		SMV

ALSO 5J

WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A41	P7-1	ADVANCE SW TERM. 4	24		APB
A42	ADVANCE SW TERM 4	P11-5	24		APB
A43	ADVANCE SW TERM. 4	P9-L	24		APB
A44	P7-2	P11-17	24		CMV
A45	P7-4	P9-15	24		ET
A46	P7-5	P11-4	24		TLV
A47	P7-F	WRITE SW TERM. 3	24		+15V
A48	WRITE SW TERM. 3	P10-8	24		+15V
1J	WRITE SW TERM. 3	STOP SW TERM. 3	24		+15V
A50	STOP SW TERM. 3	P9-3	24		+15V
2J	STOP SW TERM. 3	LOCK SW TERM 2	24		+15V
A52	LOCK SW TERM 2	P11-11	24		+15V
A53	BLOCK REWIND SW TERM 3	P11-M	24		+15V
3J	BLOCK REWIND SW TERM 3	READ SW TERM. 3	24		+15V
A55	BLOCK REWIND SW TERM. 3	P10-11	24		+15V
A56	P7-8	P11-12	24		RV
A57	P7-9	STOP SW. TERM. 1	24		SL
A58	P7-13	WRITE SW TERM. 1	24		WL
A59	P7-S	READ SW. TERM. 1	24		DL
A60	P7-15	P11-A	24		DATA
A61	P7-T	P10-C	24		PRE "A"
A62	P7-16	READ SW TERM. 4	24		RDB
A63	P7-U	P10-E	24		PRE "B"
A64	P7-17	P11-14	24		PRE COM.
A65	P11-R	P10-F	24		PRE COM.
A66	P8-1	P9-9	24		$\overline{RCD}$
A67	P8-2	BLOCK REWIND SW TERM. 1	24		EL
A68	P8-C	BLOCK REWIND TERM. 4 SW.	24		RWB
A69	P9-B	P10-K	24		DWB
A70	P8-4	P11-15	24		RW
A71	P9-J	P10-H	24		DWA
A72	P8-6	P11-D	24		ERROR
A73	P8-8	P9-T	24		$\overline{RW}$
A74	P8-9	P9-R	24		$\overline{AMV}$
A75	P8-M	P11-E	24		$\overline{READ}$
A76	P8-11	P9-U	24		$\overline{READ}$
A77	P8-12	P9-2	24		FDR
A78	P8-13	P11-1	24		EFF
A79	P8-S	WRITE SW TERM. 4	24		-15V
4J	WRITE SW TERM. 4	STOP SW TERM. 4	24		-15V

WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A81	WRITE SW TERM. 4	P9-1	24		-15V
A82	STOP SW. TERM 4	P11-K	24		-15V
A83	P11-9	ADV SW TERM. 2	24		-15V
5J	BLOCK REWIND SW TERM. 2	READ SW TERM. 4	24		OV
A84	STOP SW. TERM 1	REWIND SW TERM 4	24		SL
A86	P8-16	P10-9	24		PHOTOCELL
A87	P8-U	P9-M	24		DLY
A88	P9-F	P10-16	24		FWD MTR-
A89	P9-G	P10-17	24		FWD MTR+
A90	P9-11	P11-F	24		SCL
A91	P9-16	P10-A	24		LOK
A92	P9 17	P10-Z	24		WREN
A93	P10-1	P10-J	24		WRITE ENABLE
A94	P10-B	P11-10	24		-10V
A95	P10-D	P11-3	24		+10V
A96	P10 4	TLP BD TERM. RED	24	RED	POW
A97	P10-7	P11-B	24		+4V
A98	P10-12	P11-16	24		SOL
A99	P10-15	P11-8	24		REV MTR+
A100	LOCK SW TERM. 4	P11-2	24		LO
7J	LOCK SW TERM 4	LOCK SW TERM 3	22	BARE	LO
A102	Q1-C	P14-H	22		
A103	Q1-E	P14-E	22		
A104	Q1-B	P14 B	22		
A105	Q2-E	P14-G	22		
A106	Q2-B	P14-F	22		
A107	Q2-C	P14-D	22		
A108	P9-C	P8-D	24		DWB
A109	P9-K	P8-5	24		DWA
A110	P11-8	REWIND SW TERM 2	24		RLB
A111	J5-19	P7-C	24		RDC2

TCA-4008

Figure 4-14. Interconnection Diagram - A1 Model TCA

WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A01	J6-1	TLP BD TERM BLK	18	BLK	L1
A02	J6-2	TLP BD TERM WHT	18	WHT	L2
A03	J6-3	E1	18	GRN	FRAME
A04	E1	P10-10	24	GRN	FRAME
A05	E1	J5-20	24	GRN	FRAME
A06	J5-3	P10-5	24		+16V
A07	J5-4	STOP SW TERM. 2	24		SPB
A08	STOP SW. TERM. 2	P9-D	24		SPB
A09	P9-4	P8-P	24		SPB
A10	J5-5	P7-R	24		PPB
A11	J5-6	WRITE SW TERM. 2	24		WPB
A12	WRITE SW TERM 2	P9-S	24		WPB
A13	J5-7	P11-J	24		TLR
A14	J5-8	P7-11	24		ST
A15	J5-9	P8-7	24		CLOCK
A16	P8-H	P11-L	24		CLOCK
A17	J5-10	P7-M	24		PD
A18	J5-11	P7-J	24		200B
A19	P7-K	P9-P	24		200B
A20	P9-13	P11-U	24		200B
A21	J5-12	P8-K	24		READ
A22	J5-13	P9-N	24		FWD
A23	P9-12	P7-P	24		FWD
A24	J5-14	P9-10	24		SMT
A25	J5-15	P8-3	24		WB
A26	J5-16	P8-E	24		WA
A27	J5-17	P11-C	24		516
A28	J5-18	P8-B	24		0V
A29	P8-A	LOCK SW. TERM. 5	24		0V
A30	LOCK SW TERM 5	P9-7	24		0V
A31	P9-H	TLP BD TERM ORN	24	ORN	0V
A32	LOCK SW TERM. 5	ADV SW TERM 2	24		0V
A33	P11-7	P10-16	24		0V
A34	P11-6	P10-14	24		0V
A35	J5-21	P9-14	24		PTOF
A36	J5-22	P8-17	24		SRWX
A37	J5-23	P8-10	24		RCD
A38	J5-24	P7-14	24		REV
A39	REWIND SW TERM. 2	P11-H	24		0V
A40	J5-25	P9-8	24		SMV

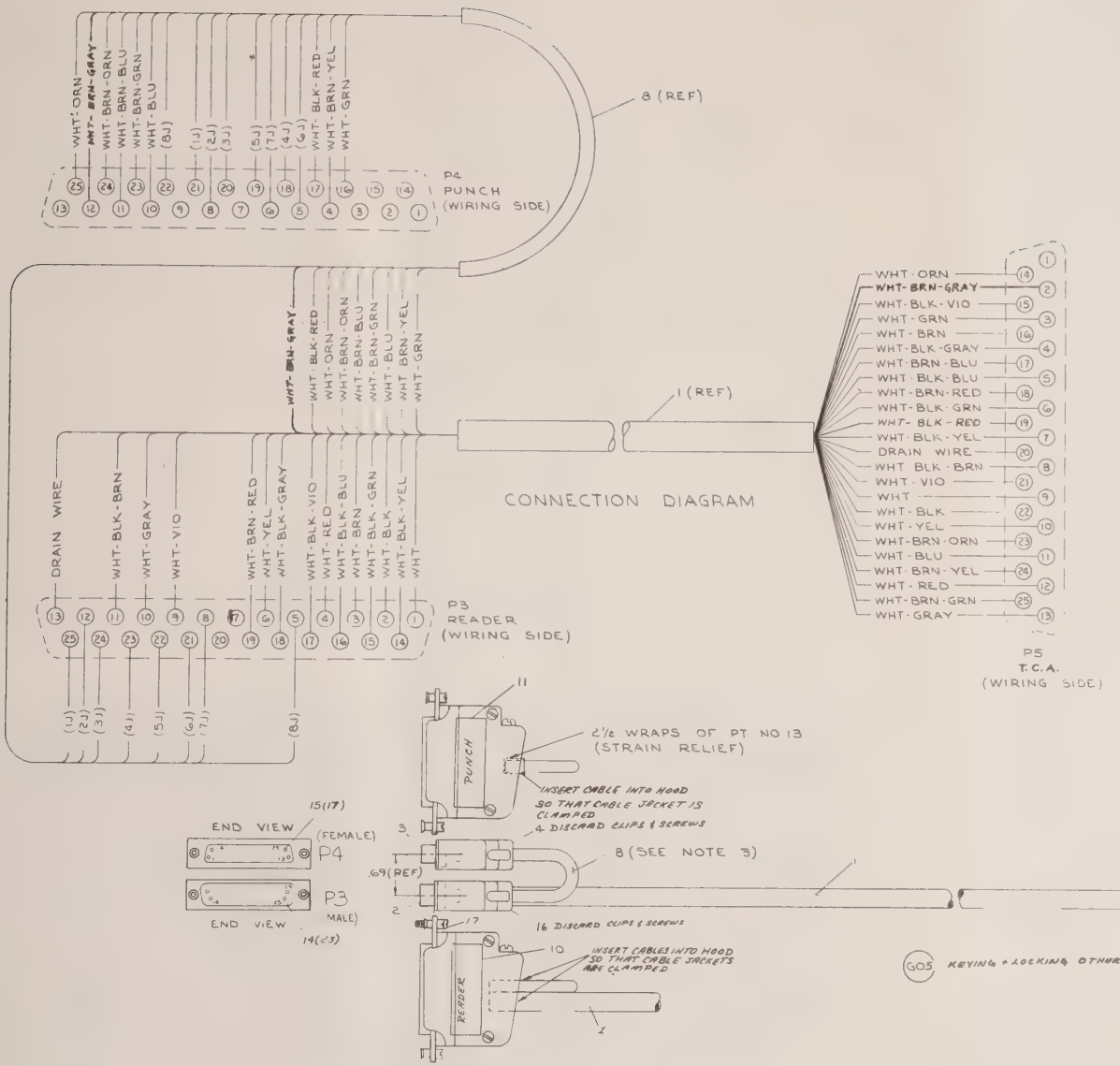
ALSO 5J

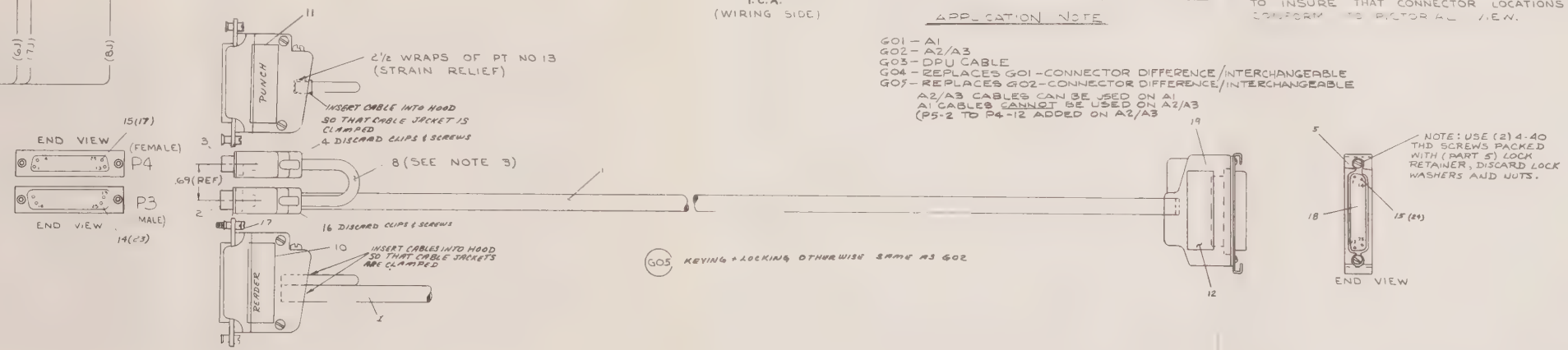
WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A41	P7-1	ADVANCE SW TERM. 4	24		APB
A42	ADVANCE SW TERM. 4	P11-5	24		APB
A43	ADVANCE SW TERM. 4	P9-L	24		APB
A44	P7-2	P11-17	24		AMV
A45	P7-4	P9-15	24		ET
A46	P7-5	P11-4	24		TLV
A47	P7-F	WRITE SW TERM 3	24		+15V
A48	WRITE SW TERM 3	P10-8	24		+15V
1J	WRITE SW TERM 3	STOP SW TERM. 3	24		+15V
A50	STOP SW TERM. 3	P9-3	24		+15V
2J	STOP SW TERM. 3	LOCK SW TERM. 2	24		+15V
A52	LOCK SW TERM 2	P11-11	24		+15V
A53	BLOCK SENSING SW TERM. 4	P11-M	24		+15V
3J	BLOCK SENSING SW TERM. 3	READ SW TERM 3	24		+15V
A55	BLOCK SENSING SW TERM. 3	P10-11	24		+15V
A56	P7-8	P11-12	24		RV
A57	P7-9	STOP SW TERM. 1	24		SL
A58	P7-13	WRITE SW TERM. 1	24		WL
A59	P7-S	READ SW TERM 1	24		DL
A60	P7-15	P11-A	24		DATA
A61	P7-T	P10-C	24		PRE "A"
A62	P7-16	READ SW TERM. 4	24		RDB
A63	P7-U	P10-E	24		PRE "B"
A64	P7-17	P11-14	24		PRE COM.
A65	P11-R	P10-F	24		PRE COM.
A66	P8-1	P9-9	24		RCD
A67	P8-2	BLOCK SENSING SW TERM. 1	24		EL
A68	P8-C	BLOCK SENSING SW TERM. 4	24		RWB
A69	P9-B	P10-K	24		DWB
A70	P8-4	P11-15	24		RW
A71	P9-J	P10-H	24		DWA
A72	P8-6	P11-D	24		ET
A73	P8-8	P9-T	24		RW
A74	P8-9	P9-R	24		AMV
A75	P8-M	P11-E	24		READ
A76	P8-11	P9-U	24		READ
A77	P8-12	P9-2	24		FDR
A78	P8-13	P11-1	24		SRWX
A79	P8-S	WRITE SW TERM. 4	24		-15V
4J	WRITE SW. TERM. 4	STOP SW TERM. 4	24		-15V

WIRE IDENT.	FROM	TO	SIZE (AWG)	COLOR	SIGNAL (REF.)
A81	WRITE SW TERM 4	P9-1	24		-15V
A82	STOP SW TERM 4	P11-K	24		-15V
A83	P11-9	ADV SW TERM 2	24		-15V
5J	BLOCK SENSING SW TERM. 5	[illegible] SW TERM 2	24		0V
A84	STOP SW TERM 1	REWIND SW TERM 4	24		SL
A86	P8-16	P9-9	24		PHOTOCELL
A87	P8-U	P9-M	24		DLY
A88	P11-F	P10-16	24		FWD MTR-
A89	P9-6	P10-17	24		FWD MTR+
A90	P9-11	P11-F	24		SCL
A91	P9-16	P10-A	24		LOK
A92	P9-17	P10-2	24		WREN
A93	P10-1	P10-J	24		WRITE ENABLE
A94	P10-B	P11-10	24		-10V
A95	P10-D	P11-3	24		+10V
A96	P10-4	TLP BD TERM. RED	24	RED	POW
A97	P10-7	P11-B	24		+4V
A98	P10-12	P11-16	24		SOL
A99	P10-15	P11-8	24		REV MTR+
A100	LOCK SW TERM. 4	P11-2	24		LO
7J	LOCK SW TERM 4	LOCK SW TERM 3	22	BARE	LO
A102	Q1-C	P14-H	22		
A103	Q1-E	P14-E	22		
A104	Q1-B	P14-B	22		
A105	Q2-E	P14-G	22		
A106	Q2-B	P14-F	22	/	
A107	Q2-C	P14-D	22		
A108	P9-C	P8-D	24		DWB
A109	P9-K	P8-5	24		DWA
A110	P11-9	REWIND SW TERM 2	24		RLB
A111	J5-19	P7-C	24		RDC2
A112	J5-2	P8-15	24		548

TCA-4009

Figure 4-15. Interconnection Diagram - A2 and A3 Models TCA




2½ WRAPS OF PT NO 13 (STRAIN RELIEF)
INSERT CABLE INTO HOOD SO THAT CABLE JACKET IS CLAMPED & DISCARD CLIPS & SCREWS
8 (SEE NOTE 3)
69 (REF)
16 DISCARD CLIPS & SCREWS
INSERT CABLES INTO HOOD SO THAT CABLE JACKETS ARE CLAMPED
PUNCH
READER
END VIEW
15(17)
P4 (FEMALE)
P3 (MALE)
14(23)
GO5 KEYING & LOCKING OTHERWISE SAME AS GO2
NOTE: USE (2) 4-40 THD SCREWS PACKED WITH (PART 5) LOCK RETAINER, DISCARD LOCK WASHERS AND NUTS.

CONNECTION CHART FOR CABLE PT NO. 1

WIRE COLOR	FROM	TO	REMARKS	SIGNAL (REF.)
WHT-GRN	P5-3	P4-16	*	+16V
WHT-BLK-GRAY	P5-4	P3-18		SPB
WHT-BLK-BLU	P5-5	P3-16		FPB
WHT-BLK-GRN	P5-6	P3-15		WPB
WHT-BLK-YEL	P5-7	P3-14		TLR
WHT-BLK-BRN	P5-8	P3-11		ST
WHT	P5-9	P3-1		CLOCK
WHT-YEL	P5-10	P3-6		PD
WHT-BLU	P5-11	P4-10	*	1200B
WHT-RED	P5-12	P3-4		READ*
WHT-GRAY	P5-13	P3-10		FWD*
WHT-ORN	P5-14	P4-25	*	SMT
WHT-BLK-VIO	P5-15	P3-17		WB
WHT-BRN	P5-16	P3-3		WA
WHT-BRN-BLU	P5-17	P4-11	*	516
WHT-BRN-RED	P5-18	P3-19		OV
DRAIN WIRE	P5-20	P3-13		AA
WHT-VIO	P5-21	P3-9		PTOF
WHT-BLK	P5-22	P3-2		SRW
WHT-BRN-ORN	P5-23	P4-24	*	RCD*
WHT-BRN-YEL	P5-24	P4-4	*	REV
WHT-BRN-GRN	P5-25	P4-23	*	SMV
WHT-BLK-RED	P5-19	P4-17	*	RDC2
WHT-BRN-GRAY	P5-2	P4-12	*	348

APPLICATION NOTE

G01 – A1
G02 – A2/A3
G03 – DPU CABLE
G04 – REPLACES G01 – CONNECTOR DIFFERENCE/INTERCHANGEABLE
G05 – REPLACES G02 – CONNECTOR DIFFERENCE/INTERCHANGEABLE
A2/A3 CABLES CAN BE USED ON A1
A1 CABLES CANNOT BE USED ON A2/A3
(P5-2 TO P4-12 ADDED ON A2/A3

(MAKE JUMPERS FROM PT 6)
JUMPER CONNECTOR CHART

JUMPER DESIGN.	LENGTH	STRIP 5.02 BOTH ENDS	FROM	TO	REMARKS	SIGNAL (REF.)
1J	8.25	.17	P3-25	P4-21	*	A1
2J	8.25	.17	P3-12	P4-8	*	A2
3J	8.25	.17	P3-24	P4-20	*	A3
4J	8.25	.17	P3-23	P4-18	*	A4
5J	8.25	.17	P3-22	P4-19	*	A5
6J	8.25	.17	P3-21	P4-5	*	A6
7J	8.25	.17	P3-8	P4-6	*	A7
8J	8.25	.17	P3-5	P4-22	*	A8

* ROUTE THRU SHRINK TUBING, PART NO. 5, AS SHOWN IN CONNECTION DIAGRAM.

NOTES:

1. CUT THE FOLLOWING LEADS FLUSH WITH THE OUTER COVERING, ON BOTH ENDS, AFTER THE OUTER COVERING HAS BEEN STRIPPED BACK AS INDICATED.

   WHT-BLK-ORN
   WHT-BRN-VIO

2. INSULATE BOTH ENDS OF DRAIN WIRE WITH TUBING, PT NO 3 BEFORE ATTACHING CONNECTORS
3. HEAT SHRINK TUBING AFTER ASSEMBLY TO INSURE THAT CONNECTOR LOCATIONS CONFORM TO PICTORIAL VIEW.

TCA-4010

Figure 4-16. TCA Cable A1, A2 and A3 Models TCA

FROM TCA PCB	TO TCA CONNECTOR J5	TCA SIGNAL	READER/PUNCH PLUGS	DPU	TRP
TUC P8-15	J5-2	$\overline{S48}$	P4-12	----	B13
	-3	+16	P4-16	P3-14	----
STOP SW - TERM. 2	-4	SPB	P3-18	P3-3	D03
TUC P7-R	-5	PPB	P3-16	P3-5	D12
WRITE SW - TERM. 2	-6	WPB	P3-15	P2-6	D10
TPS P11-J	-7	TLR	P3-14	P2-7	D08
TUC P7-11	-8	ST	P3-11	P3-8	C04
TUC P8-7	-9	CLOCK	P3-1	P3-10	A12
TUC P7-M	-10	$\overline{PD}$	P3-6	P3-6	D02
TUC P7-J	-11	$\overline{1200B}$	P4-10	P2-13	B09
TUC P8-K	-12	$\overline{READ}$	P3-4	P3-4	D04
TMC P9-N	-13	$\overline{FWD}$	P3-10	P3-9	C05
TMC P9-10	-14	SMT	P4-25	P3-12	B14
TUC P8-3	-15	WB	P3-17	P3-7	D13
TUC P8-E	-16	$\overline{WA}$	P3-3	P2-14	D11
TPS P11-C	-17	$\overline{S16}$	P4-11	----	B11
TUC P8-B	-18	0V	P3-19	P2-1	A14
TUC P7-C	-19	RDC2	P4-17	P2-12	E10
E1 - Gnd Frame	-20	AA (Drain)	P3-13	----	----
TMC P9-14	-21	PTOF	P3-9	P3-2	C06
TUC P8-17	-22	SRWX	P3-2	P2-8	D09
TUC P8-10	-23	$\overline{RCD}$	P4-24	P2-10	B12
TUC P7-14	-24	$\overline{REV}$	P4-4	P2-9	E09
TMC P9-8	J5-25	SMV	P4-23	P3-11	B10
PSCC B12 or DPU Bd		STIN (DPU ERASE)			B03
PSCC or DPU Bd		CS (33.3 ms +8.3 ms)			A07

TermiNet Printer { P3 = Reader Plug; P4 = Punch Plug

TCA-4011

Figure 4-17. TCA Interconnection List

CHAPTER V

MAINTENANCE

SECTION 1

ROUTINE MAINTENANCE

WARNING

REMOVE POWER FROM TCA BEFORE PERFORMING THE FOLLOWING.

EXTERIOR CLEANING

Use a damp cloth to remove dust from exterior of TCA. Use a mild detergent to remove stubborn dirt or ink.

TAPE HEAD CLEANING

1. Using a camera lens blower/brush or a soft bristled brush, remove dust from all accessible areas of the tape deck with cassette door open.

2. Clean the tape head (see Figure 5-1) with cotton tip swabs or cotton balls and denatured alcohol. Make certain that no cotton strands are left on the head. The tape head should be cleaned after every 40 hours of use.

CAUTION

DO NOT USE CLEANING TAPES.

3. When performing Preventative Maintenance, clean rubber rimmed drive wheel and forward motor shaft. Apply a drop of light oil on forward motor bearing.

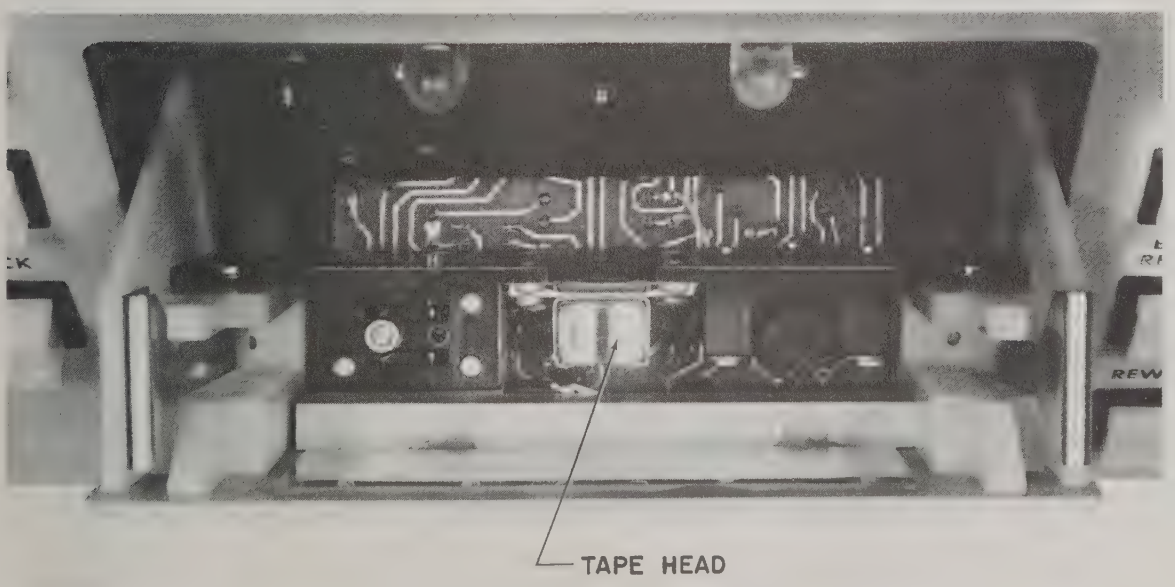
CASSETTES

1. Store the cassettes in their containers.

2. Remove any signs of dust from the cassettes with a camera lens blower/brush or soft bristled brush, especially the open, tape end of the cassette.

NOTE

Magnetic tape cassettes after extended use become less reliable and can cause data loss or error.



TCA-4033

Figure 5-1. Tape Head

SECTION 2

PARTS REMOVAL AND REPLACEMENT AND ADJUSTMENTS

CAUTION

BEFORE REMOVING ANY COMPONENTS FROM THE TCA, TURN OFF THE PRINTER AND DISCONNECT THE CONNECTOR AND POWER CORD FROM THE REAR OF THE TCA.

LAMPS

The WRITE, ADVANCE, READ, and BLOCK REWIND pushbutton indicators use Lamp No. 7-459.

For the STOP pushbutton indicator, use Lamp No. 327. Refer to Cassette Accessory (TCA) Operator's Manual (GEK-15209) for remove and replace details if necessary.

TCA ENCLOSURE

1. Disconnect interconnection cable and power cord from rear of TCA.

2. Set the TCA in an inverted position on a firm flat surface.

3. Remove two screws on the bottom of TCA, turn over and remove one screw on the rear of unit above the nameplate (see Figure 5-2).

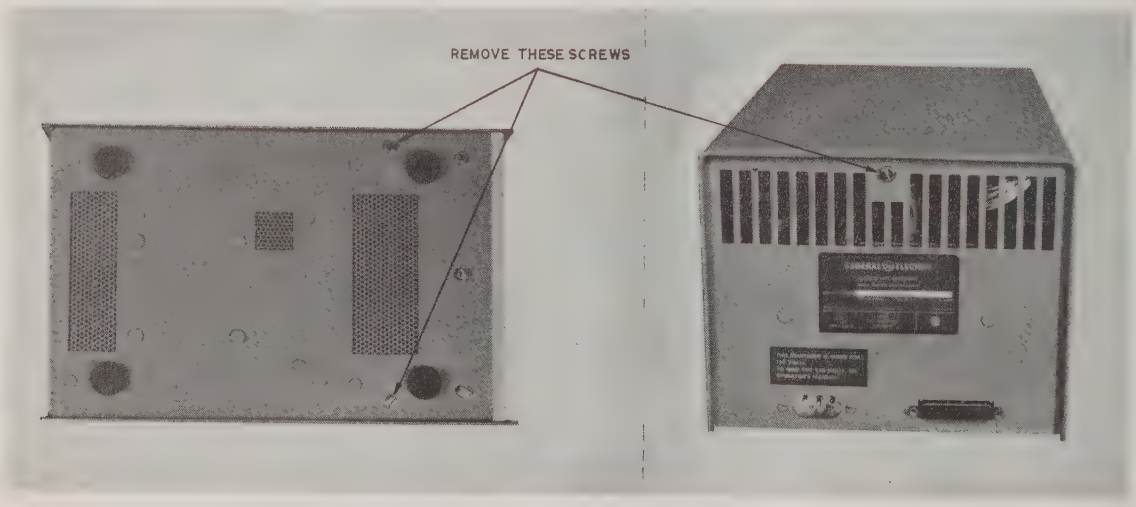
4. Using one hand on each side of the enclosure, lift and remove the enclosure carefully so that the wiring is not snagged and damaged.

PUSHBUTTON SWITCH/INDICATOR

(All except LOCK)

1. Remove TCA enclosure.

2. Unsolder leads from switch/indicator. Note which terminal each wire is connected to for correct installation.

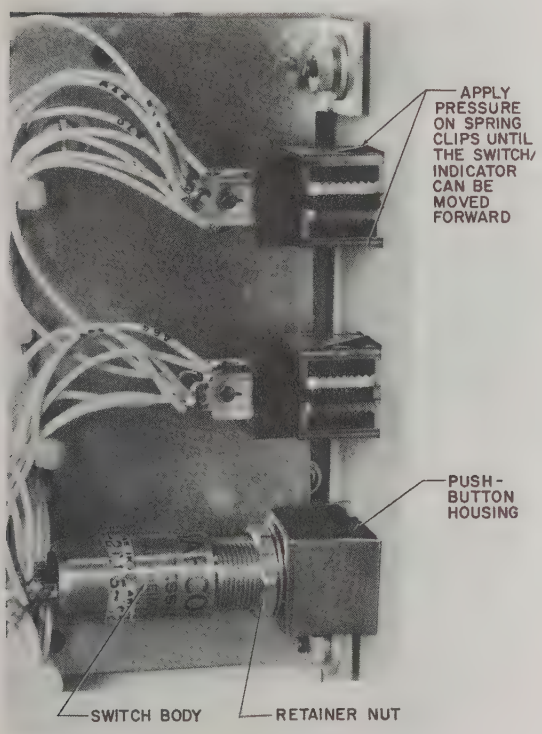


TCA-4002B

Figure 5-2. Enclosure Screws

3. Apply pressure to each spring clip as shown by Figure 5-3 until the switch/indicator can be moved forward and out of the front panel.

4. To install new switch, position spring clips on the switch as they were and slide switch/indicator in the front panel until the springs snap open and secure the switch/indicator to the front panel.


APPLY PRESSURE ON SPRING CLIPS UNTIL THE SWITCH/ INDICATOR CAN BE MOVED FORWARD
PUSH-BUTTON HOUSING
SWITCH BODY
RETAINER NUT

TCA-4021

Figure 5-3. Pushbutton Switch/Indicator Removal

LOCK PUSHBUTTON SWITCH/INDICATOR

1. Remove TCA enclosure.

2. Unsolder leads from LOCK Switch/Indicator. Note which terminal each wire is connected to for correct installation.

3. Remove white pushbutton lens and lamp by pulling straight out.

4. Loosen retainer nut at least 5 turns (see Figure 5-3).

5. Rotate switch body counterclockwise until it separates from the pushbutton housing. The switch and hardware can now be removed from the front panel of the TCA.

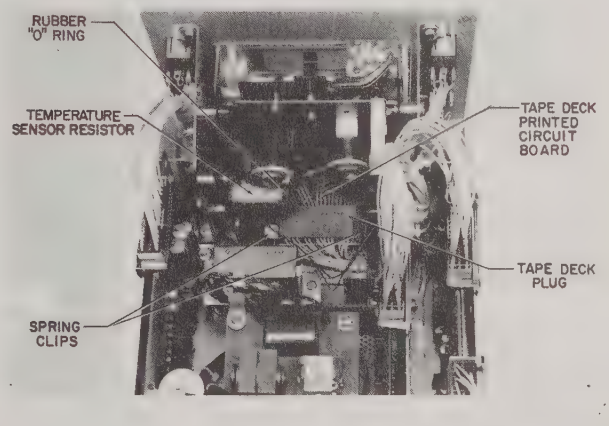
NOTE

When installing, rotate the switch body clockwise into pushbutton housing until a stop in the housing is reached. Make certain all the hardware is in place according to Figure 5-3.

TAPE DECK

1. Remove TCA enclosure.

2. Slide the temperature sensor resistor which is wired to the TMC PCB off the mounting shaft. Slide resistor over rubber "O" ring (Figure 5-4).



TCA-4034

Figure 5-4. Tape Deck Removal

3. Spread the spring clips and remove the tape deck plug from tape deck printed circuit board and plug from TPS PCB.

4. Remove three screws on bottom of chassis securing the front panel and move front panel and tape deck forward about one inch.

5. Remove six screws and spacers securing tape deck to TCA frame. There are three screws on each side of the tape deck.

6. Grasp tape deck by side frame and lift straight up and out of TCA frame.

7. To install tape deck, install cassette and reverse procedure.

NOTE

When securing the tape deck to the TCA frame with the six screws, make certain tape deck door can open and close without binding to TCA front panel.

TAPE DECK PHOTOCELL

1. Remove tape deck.

CAUTION

KEEP ALL HARDWARE SEPARATED DURING DISASSEMBLY TO ASSURE IDENTICAL BUILDUP AT REASSEMBLY.

2. Remove door by removing 7/8 inch screw and brass bushing on left side and 3/4 inch screw on right side (of 3 screws closest to door front, these are the center screws). Disconnect ground lead from door.

CAUTION

DO NOT STRESS GROUND LEAD END CONNECTIONS WHEN REMOVING DOOR.

3. Looking at deck from bottom, remove Printed Circuit Board which includes electronic components by removing 1 1/4 inch screw, lockwasher, flat washer, fiber washer, and 1/2 inch nylon spacer on left side and 5/8 inch screw, two flat washers, and 5/16 inch nylon spacer on right side.

4. Disconnect Printed Circuit Board connector from read/write head.

CAUTION

ASSURE THAT NOTCH IN CONNECTOR IS ORIENTED TO RIGHT AT REASSEMBLY.

5. Move Printed Circuit Board downward to gain access to small photocell mounting board near left side.

6. Remove two 5/8 inch mounting screws (each with one star washer and one flat washer) attaching small photocell mounting board to white nylon mounting block. Black metal guide on top of white nylon mounting block will now be loose.

7. Carefully slide small photocell mounting board containing photocell and light source down and out of white nylon mounting block.

CAUTION

DO NOT STRESS PHOTOCELL, LIGHT SOURCE AND ADJACENT WIRING.

8. Using grounded pencil soldering iron (with maximum rating of 10 watts, such as Ungar "Princess" three wire soldering iron*), unsolder photocell from mounting board and replace with new photocell (44A417381-101). Position photocell on board so that height from top mounting surface of mounting board to top surface of photocell is 17/32 ± 1/32 inch. When reassembled, top surface of photocell must not extend above surface of tape guide.

9. Indicate replacement of photocell in tape deck assembly by placing dot of paint (preferably yellow) on right side of door mounting bracket.

10. To reassemble, reverse steps 1 through 8.

CAUTION

DO NOT PINCH LEADS DURING REASSEMBLY.

TCA REWIND SPINDLE

The TCA rewind spindle could possibly work loose on its shaft. If the fit is not too loose (hole not enlarged), cement spindle onto the shaft as follows:

1. Remove the spindle from the shaft.

---

*Obtainable from:
Ungar Division of Eldon Industries
223 East Manville Street
Compton, California 90220

2. Put two drops of Loctite* into the spindle shaft hole.

3. Press the spindle completely onto the shaft.

CAUTION

DO NOT ALLOW CEMENT TO GET INTO THE MOTOR. WIPE AWAY ANY EXCESS CEMENT.

4. Allow the cement to cure per the requirements listed on the container label.

5. Operate the TCA ADVANCE and REWIND several times to insure the spindle is secure.

If the spindle hole is too worn to cement, install a new spindle (Part No. 44A417381-107). It is recommended that the new spindle be cemented in place. A cemented spindle does not interfere with TCA teardown because the hole in the mounting plate is larger than the spindle diameter.

NOTE

Later manufactured units have a "D" shaped motor shaft which eliminates the above problem. In turn, a spindle with a "D" shaped hole is used on these shafts (see Chapter VI - Parts).

REWIND MOTOR

A1 MODEL

1. Remove TCA enclosure.

2. Remove tape deck.

3. Cut cable ties and unsolder wires on pre-amp PCB that go to motor.

4. Remove tape deck door by removing 7/8 inch screw and brass bushing on left side and 3/4 inch screw and washer on right side (of three screws closest to door front, these are the center screws).

5. Remove rewind motor (Figure 5-5) by removing three screws and washers holding motor to mounting plate.

6. To install new motor, reverse above procedures and a) ensure motor cushion is pointing up, and b) wire connections are correct. Looking from rear of pre-amp PCB, the leads are red, black, red, black, and black.

A2/A3 MODELS

1. Remove TCA enclosure.

2. Remove tape deck door by removing 7/8 inch screw and brass bushing on left side and 3/4 inch screw and washer on right side (of three screws closest to door front, these are the center screws).

CAUTION

DO NOT STRESS GROUND LEAD END CONNECTION.

3. Cut wire cable ties and remove red and black motor lead from pin sockets on the pre-amp PCB.

4. Remove three screws and washers holding motor (Figure 5-5) to mounting plate.

5. To install new motor, reverse above procedures and a) ensure motor cushion is pointing up, and b) wire connections are correct. Looking from rear of pre-amp, the leads are red, black, red, black, and black.

FORWARD MOTOR

A1 MODEL

1. Perform steps 1 through 4 of Rewind motor A1 model motor removal.

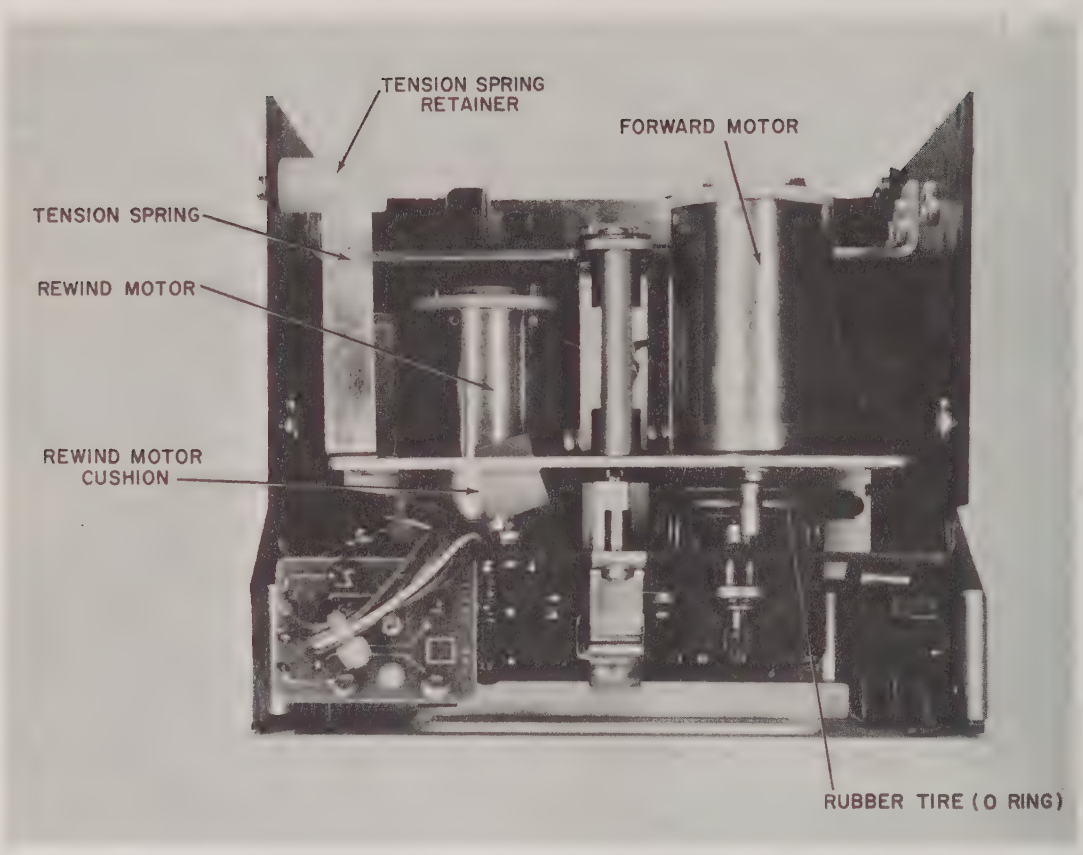
2. Remove screw, lockwasher, and washer under cassette hold-down spring (Figure 5-6).

3. Slip forward motor and motor mount out of brass bushing.

4. Remove motor from motor mount by removing three screws.

5. To install, reverse above procedures. Ensure that:

*Registered Trademark of Loctite Corp.



TCA-4012

Figure 5-5. Tape Deck

FORWARD MOTOR, A1 MODEL - Continued

a. The top motor tension spring is under the plastic retainer.

b. The forward motor lifts off rubber tire in Rewind.

c. The minimum force to lift forward motor off drive wheel when running and have the drive wheel stop is 280 grams. Adjust tension spring as necessary.

A2/A3 MODELS

1. Remove TCA enclosure.

2. Open tape deck door.

3. Remove screw, lockwasher, and washer under cassette hold-down spring (Figure 5-6).

4. Cut cable ties securing motor wires.

5. Remove red and black leads from pin sockets on pre-amp PCB (note location). Slip forward motor and motor mount out of brass bushing.

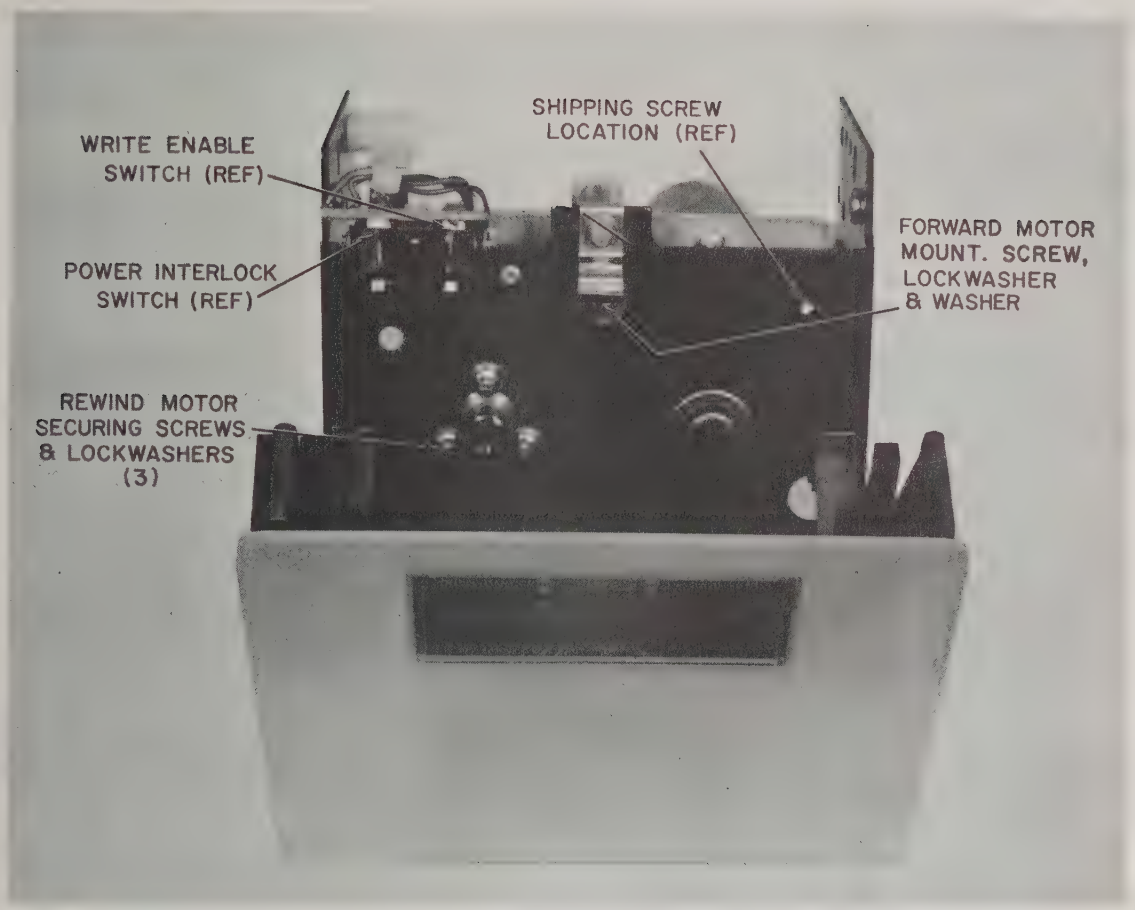
6. Remove motor from motor mount by removing three screws.

7. To install, reverse above procedure. Ensure that:

a. The top motor tension spring is under the plastic retainer (Figure 5-5).

b. The forward motor lifts off rubber drive wheel in REWIND.

c. The minimum force to lift forward motor off drive wheel when running and have the drive wheel stop is 280 grams. Adjust tension springs as necessary.


WRITE ENABLE SWITCH (REF)
POWER INTERLOCK SWITCH (REF)
REWIND MOTOR SECURING SCREWS & LOCKWASHERS (3)
SHIPPING SCREW LOCATION (REF)
FORWARD MOTOR MOUNT. SCREW, LOCKWASHER & WASHER

TCA-4013

Figure 5-6. Forward Motor Mount Retaining Screw

RUBBER TIRE (O-RING) DRIVE WHEEL

1. Remove TCA enclosure.

2. Open tape deck door and remove screw, lockwasher, and washer located below cassette hold-down spring (Figure 5-6).

3. Slide forward motor mount out of brass bushing and to the rear to clear drive wheel.

4. Grasp the top of the rubber tire (O-ring) with fingers and remove by pulling upward and out (Figure 5-5).

5. Replace with new rubber tire by hooking tire around bottom of drive rim and pulling up and into rim on top.

6. Install forward motor mount by reversing steps 1 through 3. Ensure that:

   a. The top motor tension spring is under the plastic retainer.

   b. The forward motor lifts off rubber tire in REWIND.

   c. The minimum force to lift forward motor off drive wheel when running and have the drive wheel stop is 280 grams. Adjust tension spring as necessary.

FORWARD MOTOR SOLENOID

1. Remove tape deck.

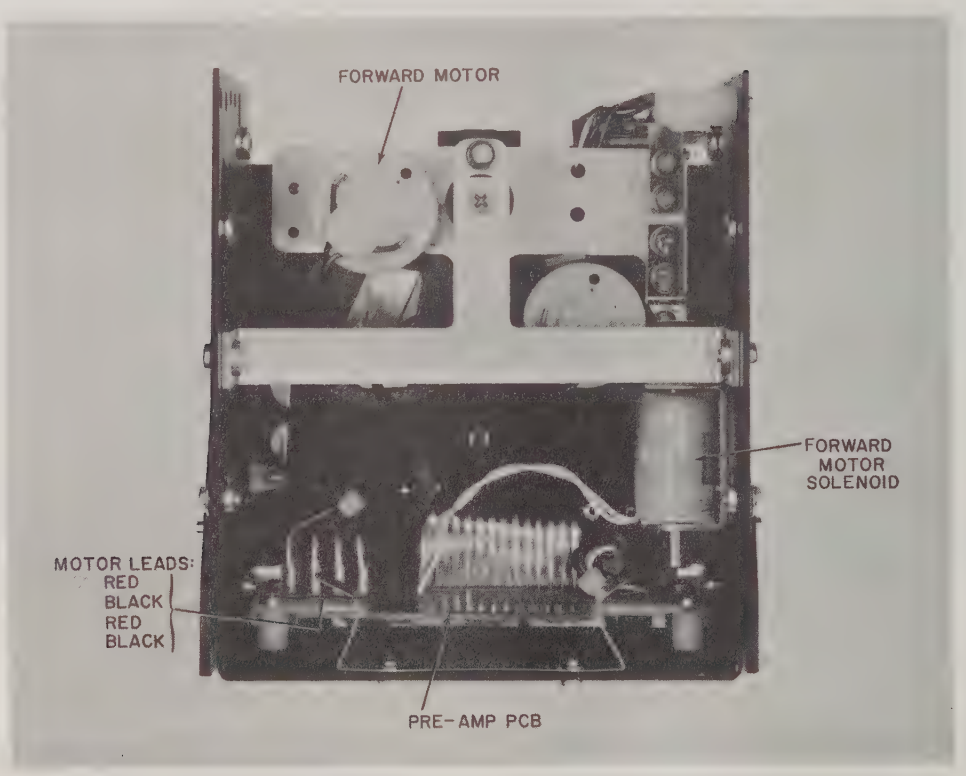
2. Unsolder wires going to solenoid on the pre-amp PCB (Figure 5-7).

3. Remove two screws and washers securing solenoid to side plate.

4. Install by reversing foregoing procedures. Ensure that:

   a. The forward motor lifts off rubber drive wheel in REWIND.

   b. The minimum force to lift forward motor off drive wheel when running and have the drive wheel stop is 280 grams. Adjust tension spring as necessary.



TCA-4014

Figure 5-7. Forward Motor Solenoid

TLP PCB

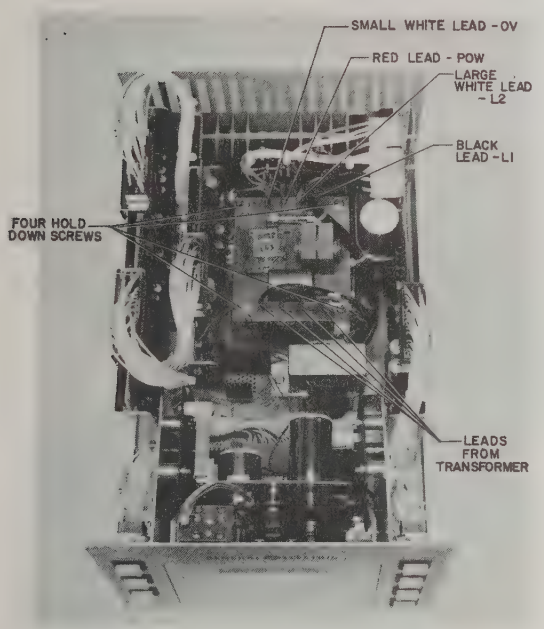
1. Remove TCA enclosure.

2. Disconnect all wires from the TLP PCB. Mark the leads if not already marked to insure that you reconnect the leads to the correct terminals (see Figure 5-8).

- Four transformer leads from T1-1, T1-2, T1-3, and T1-4.
- Small white from 0V.
- Red from POW.
- Large white from L2.
- Black from L1.

3. Remove four screws - one in each corner of the PCB.

4. Carefully remove the TLP PCB so that loose leads and cabling are not damaged.



TCA-4003

Figure 5-8. TLP PCB Removal

TUC PCB

1. Remove TCA enclosure.

2. Loosen screws securing the TUC PCB connector clamps; and lift clamps from the connectors (see Figure 5-9).

3. Disconnect two connectors from TUC PCB.

4. Carefully lift TUC PCB from the TCA.

5. After installing a new TUC PCB, perform Forward Motor Speed Adjustment.

TMC PCB

1. Remove TCA enclosure.

2. Remove temperature sensitive resistor.

3. Remove TUC PCB.

4. Loosen screw securing TMC PCB connector clamp and lift clamp from the connector (see Figure 5-9).

5. Disconnect connector from TMC PCB.

6. Carefully lift TMC PCB from the TCA.

7. After installing a new TMC PCB, perform Forward Motor Speed Adjustment.

TPS PCB

1. Remove TCA enclosure.

2. Loosen screw securing the TPS PCB connector clamp and lift clamp from the connector (see Figure 5-9).

3. Disconnect the connectors plugged in the side of the TPS PCB. (Do not pull on wires.)

4. Carefully lift TPS PCB from the TCA.

POWER TRANSFORMER

1. Remove TUC PCB.

2. Remove TMC PCB.

3. Remove TPS PCB.

4. Remove TLP PCB.

5. Remove two screws securing holder for TMC PCB and remove holder (see Figure 5-10).

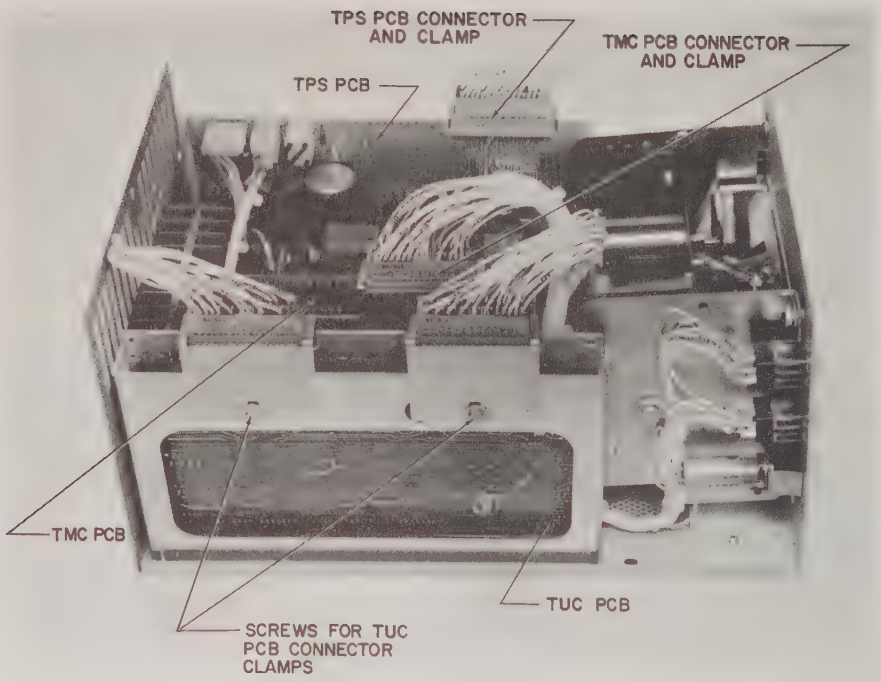
6. Remove four nuts at the base of transformer (see Figure 5-10). Note the ground leads that are secured to the transformer mounting bolts by two of the four nuts so that you can reinstall them at the same mounting bolt.

7. Carefully lift transformer from the TCA.

REACTORS (CHOKE ASSEMBLY)

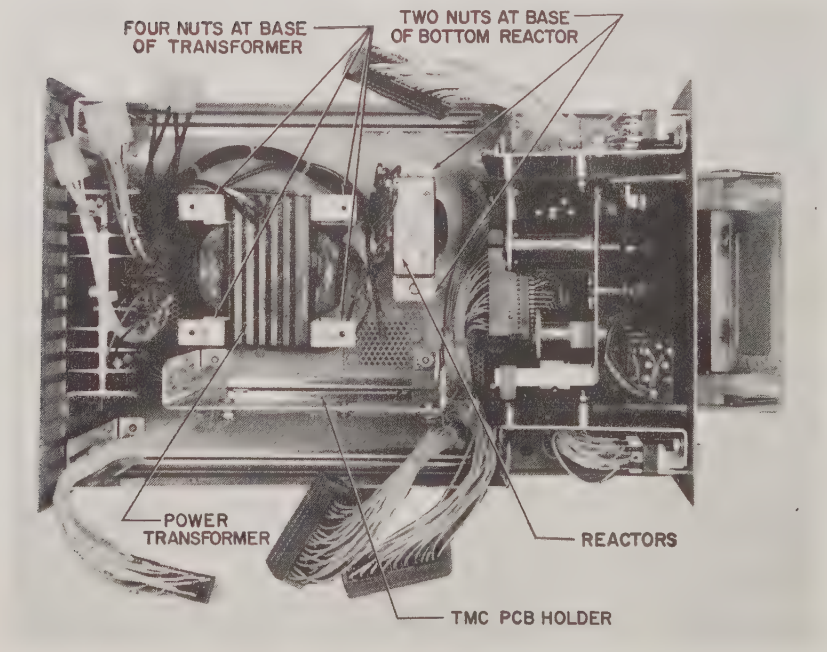
1. Remove TCA enclosure.

2. Remove TPS PCB.



TCA-4034

Figure 5-9. PCB Removal



TCA-4035

Figure 5-10. Power Transformer and Reactors Removal

REACTORS (Continued)

3. Remove TMC PCB.

4. Remove two nuts at the base of bottom reactor (Figure 5-10).

5. Remove reactors from TCA.

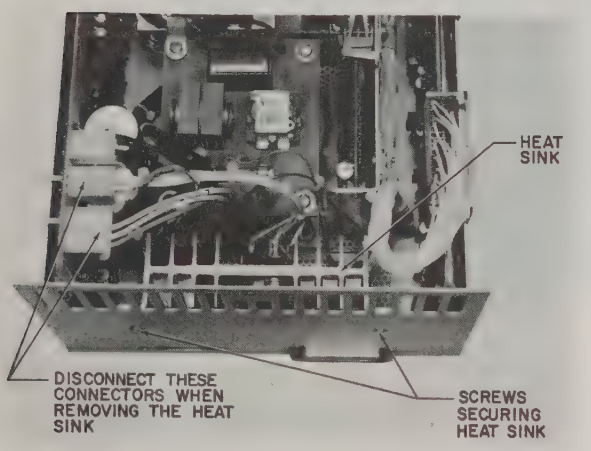
TRANSISTOR HEAT SINK

1. Remove TCA enclosure.

2. Disconnect connectors on the TPS board as shown by Figure 5-11 to remove heat sink.

3. Remove screws securing heat sink as shown by Figure 5-11.

4. Carefully lift out heat sink from TCA.



TCA-4036

Figure 5-11. Heat Sink Removal

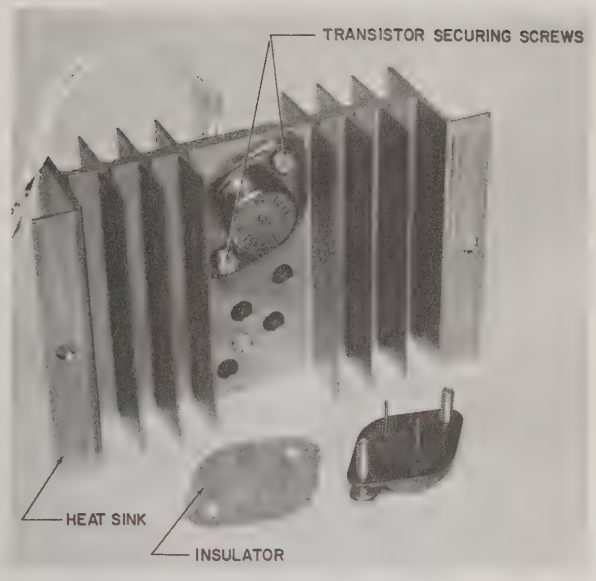
TRANSISTOR REMOVAL FROM HEAT SINK

1. Remove heat sink.

2. Remove two screws securing transistor to heat sink (Figure 5-12).

3. Pull transistor straight out from socket on heat sink.

4. Make certain that the insulator is installed when replacing the transistor.



TCA-4037

Figure 5-12. Power Transistor Removal

ADJUSTMENTS

BALANCE POT ADJUSTMENT TO ELIMINATE FORWARD MOTOR CREEP

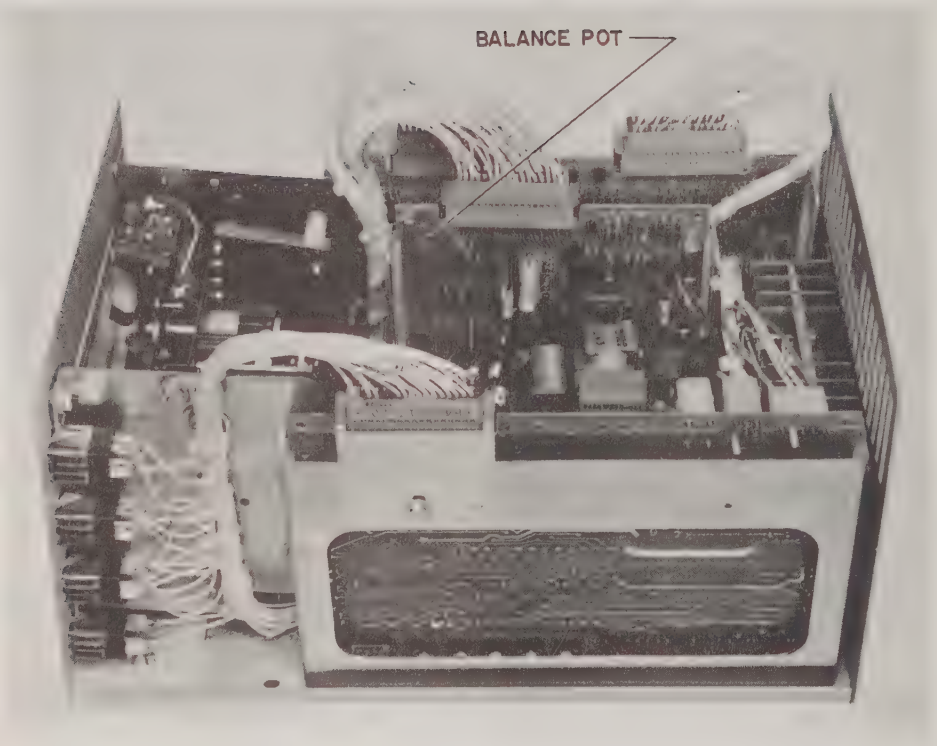
1. Press ADVANCE pushbutton for about 3 seconds, then release.

2. Watch forward motor shaft for any forward clockwise motion after button is released.

3. If motor shaft continues to creep in clockwise direction, take a small screwdriver and turn the balance potentiometer (see Figure 5-13) clockwise slowly until the motor stops, then rotate potentiometer 1/2 turn more. Do not rotate potentiometer more than 1/2 turn after the motor stops.

NOTE

Do not adjust balance potentiometers if forward motor creeps counterclockwise (spindle creeps clockwise). This condition indicates a defective TUC or TMC PCB.



TCA-4038

Figure 5-13. Balance Pot on TMC PCB

FORWARD MOTOR SPEED ADJUSTMENT

Whenever the TMC or the TUC PCB's are replaced, the forward motor speed must be adjusted so that tape speed is within specifications. The motor speed can now be adjusted in the field by using a pulse frequency counter and a special Test Tape (Part No. 44A418053-001, from General Electric Company, Data Communication Products Department, Waynesboro, Virginia 22980). It is no longer necessary to return defective TCA's to the factory for repair.

TEST PREPARATION

CAUTION

ENSURE THAT ALL TCA FUNCTIONS ARE OPERATING PROPERLY EXCEPT FOR MOTOR SPEED TIMING. THE TEST TAPE IS NOT TO BE USED FOR DEBUGGING PROBLEMS. OTHERWISE, THE TEST TAPE MAY BE DAMAGED.

1. Ensure that jumpers on CLCC PCB are installed for 30 and 120 cps:

   a. Rate switch medium position (30 cps) - cup 6 to cup 2.

   b. Rate switch high position (120 cps) - cup 5 to cup 4.

2. Check the jumpers on the TRP PCB so that they correspond to the CLCC PCB:

   TRP/1 and TRP/2

   3J in, 2J out - 120 cps when rate switch is in high position.
   2J and 3J must not be installed at the same time.

   TRP/3

   No jumpers on TRP/3 for rate selection. 120 cps is always the high Rate switch position; therefore, CLCC must be strapped as in step 1.

3. Attach input lead from a pulse frequency counter (example: Hewlett-Packard 5300A) to test point one (TP1) on the TRP PCB (ST Pulse). Allow counter to cycle several times before making any adjustments when setting Forward motor speed.

4. Remove TCA enclosure.

WARNING

117V AC OR 230V AC IS PRESENT INSIDE THE CHASSIS.

5. Install a spare blank (not test tape) cassette, and close tape deck door.

6. Press ADVANCE pushbutton and check for forward motor creep (refer to Balance Potentiometer Adjustment).

7. Press and hold ADVANCE pushbutton for 30 seconds to bring forward motor up to operating temperature.

8. Press REWIND pushbutton, tape will rewind to BOT, to bring rewind motor up to operating temperature.

9. Then press READ pushbutton with Printer RATE switch set at 120 cps. Allow tape to run until automatic stop at end of tape. DO NOT REWIND. Remove cassette.

TEST PROCEDURE

1. Install Test Tape cassette (44A418053-001).

NOTE

Make sure cassette is rewound to BOT; however, if it is not, do not press REWIND or ADVANCE pushbuttons at this point to rewind the tape since this will excessively heat one motor and change the ST frequency at TP1 on the TRP PCB. One way to rewind tape, if only one TCA is available, is to turn tape around and press READ.

WARNING

USE AN INSULATED SCREWDRIVER (EXAMPLE: FIBER SCREWDRIVER) WHEN ADJUSTING ANY POTENTIOMETERS. THIS WILL PREVENT ANY ACCIDENTAL SHORTING ON THE PCB'S.

2. Set the RATE switch at 30 cps.

3. Press READ and adjust potentiometer P1 (Figure 5-14) on the TUC for:

A1, A1A, A2, and A3 Models	1598 ±15 counts

NOTE

Only ST Pulses are recorded on the Test Tape. Any intermittent noise getting into the system may cause the interrupt indicator to light or to be interpreted as a character. Improper tape stacking in the cassette can cause tape speed to vary. If this happens, wind the tape a few times in both directions to correct the stacking. Allow 10 minutes for motors to cool before continuing test.

4. Set Printer RATE switch at 120 cps and adjust potentiometer P2 (Figure 5-14) on TUC PCB for:

A1 Model	3827 ±15 counts
A1A, A2, and A3 Models	4157 ±15 counts

5. Allow Test Tape to run until approximately two-thirds the way through. Then recheck the tape speed (steps 3 and 4). If not correct at this point, adjust balance potentiometer P1 on TMC PCB (Figure 5-15).

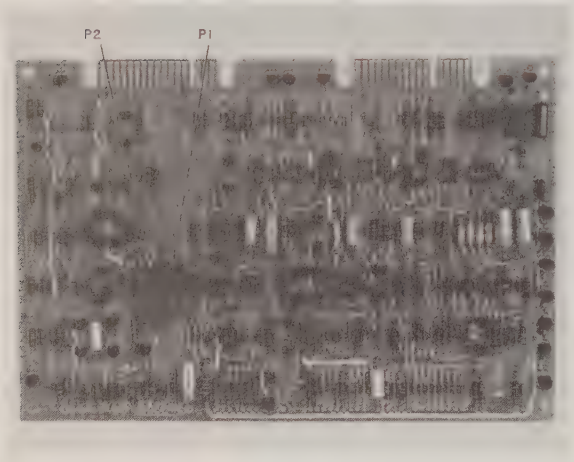
6. Recheck forward motor creep adjustment as in step 6 of Test Preparation.

7. If the TMC PCB was adjusted in step 5, return to step 1 of Test Procedure.

8. If you are unable to adjust one or more speeds (typically 150 cps), check for +15V output at pin 11 or M on the TPS PCB. Voltage should be +15 ±.4V. If out of tolerance, replace TPS PCB.

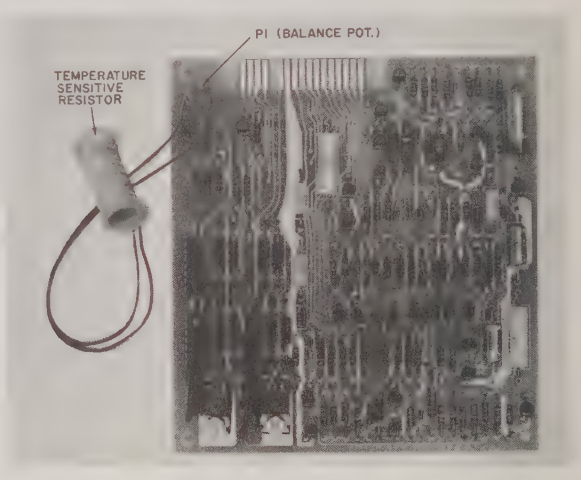
NOTE

The TPS PCB could be loaded by the TUC or the TMC PCB's. Consider possibility of other problems in these PCB's before changing the TPS PCB.



TCA-4015

Figure 5-14. TUC PCB



TCA-4016

Figure 5-15. TMC PCB

CHAPTER VI

PARTS

Locate the figure and part callout number (some figures do not have callout numbers) that points out the part in question. Locate that figure number on the following list of parts. The information on that line will include the part code number, part number, part description, and the TCA models that the part is used on. The model numbers for the TCA are as follows:

A1 3S3020AA000A1 (A1 Model, operates on nominal 117V AC.

A2/A4 - 3S3020AA000A2/A4 (A2/A4 Model), operates on nominal 117V AC.

A3 - 3S3020AA000A3 (A3 Model), operates on nominal 117V AC.

Export A1 - 3S3020AB000A1 (Export A1 Model), operates on nominal 230V AC.

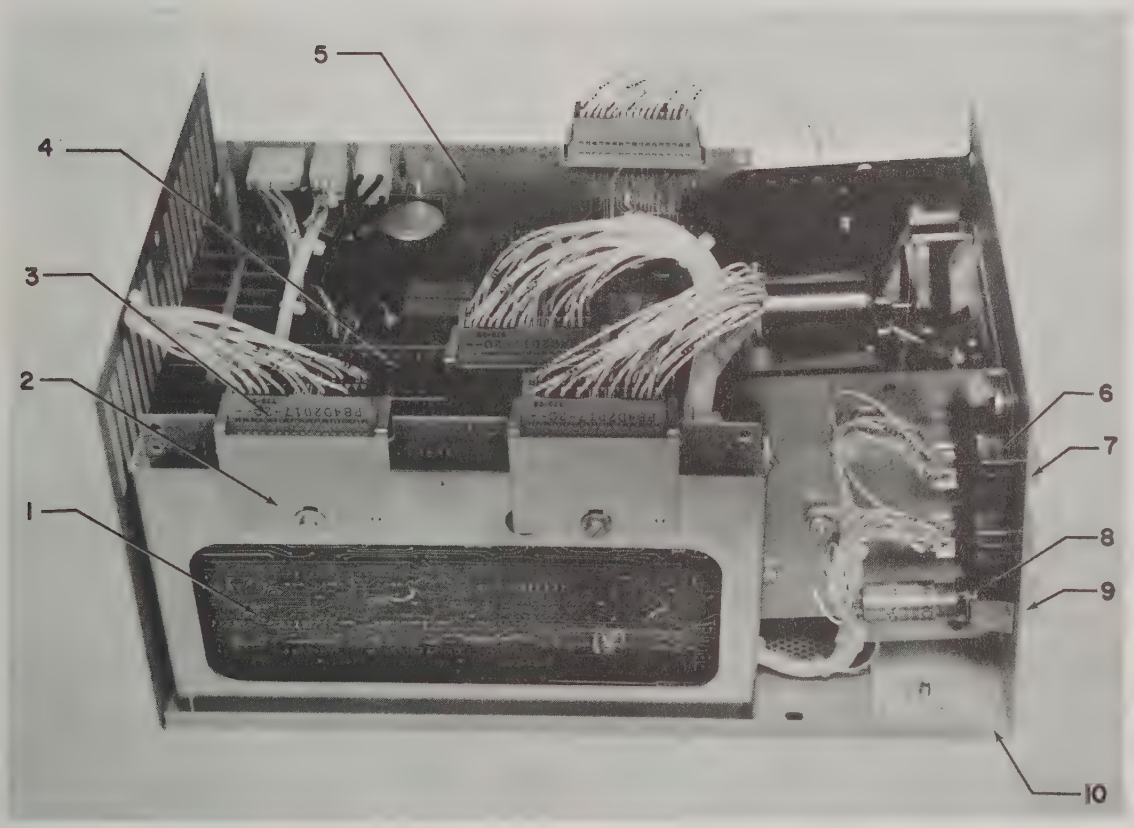
Export A2/A3 - 3S3020AB000A2/A3 (Export A2/A3 Model), operates on nominal 230V AC.

Export A4 - 3S3020AB000A4 (Export A4 Model), operates on nominal 230V AC.

							Export		
FIG.	CODE	PART NUMBER	DESCRIPTION	A1	A2/ A4	A3	A1	A2/ A3	A4
6-1-1	9042	44B417401-G01	TUC/1 Printed Circuit Board	X			X		
6-1-1	9043	44B417401-G02	TUC/2 Printed Circuit Board		X	X		X	X
6-1-2	9015	44B412370-001	Connector Holddown Bracket	X	X	X	X	X	X
6-1-3	9057	44B235826-006	Connector	X			X		
6-1-3	9058	44A417701-016	Connector		X			X	
6-1-4	9046	44B417404-G01	TMC/1 Printed Circuit Board	X			X		
6-1-4	9047	44B417404-G02	TMC/2 Printed Circuit Board		X	X		X	X
6-1-5	9040	44B417400-G01	TPS/1 Printed Circuit Board	X			X		
6-1-5	9041	44B417400-G02	TPS/2 Printed Circuit Board		X	X		X	X
6-1-6	3010	44A417700-001	Switch	X	X	X	X	X	X
6-1-7	9011	7327	Lamp(In STOP,WRITE,READ, BLOCK REWIND Pushbuttons	X	X	X	X	X	X
6-1-8	9009	516-2015-52	Lock Switch	X	X	X	X	X	X
6-1-9	3009	327	Lamp (LOCK Pushbutton)	X	X	X	X	X	X
6-1-10	9003	44D430302-G01	Front Panel Assembly	X			X		
6-1-10	9004	44D430302-G02	Front Panel Assembly		X	X		X	X
6-2-1	9044	44B417403-G01	TLP/1 Printed Circuit Board	X	X	X			
6-2-1	9045	44B417403-G02	TLP/2 Printed Circuit Board				X	X	X
6-2-2	9037	K9774741P13	Fuse (1 FU) 1 Amp	X	X	X			
6-2-2	9035	K9774741-010	Fuse (1 FU) 1/2 Amp				X	X	X
6-3-1	9019	44B430108-G01	Choke Assembly	X	X	X	X	X	X
6-3-2	9013	44C430209-G01	Main Wire Harness	X			X		
6-3-2	9014	44C430209-G02	Main Wire Harness		X	X		X	X
---	9025	44C430210-G01	Transformer Assembly (Includes TLP PCB)	X	X	X			
---	9026	44C430210-G02	Transformer Assembly (Includes TLP PCB)				X	X	X
6-3-3	9028	44C414250-G01	Transformer	X	X	X	X	X	X
6-4-1	9012	44B430107-G01	Wire Harness with Transistor Sockets	X	X	X	X	X	X
6-4-2	9029	44B430102-G01	Heat Sink Assembly	X	X	X	X	X	X
6-4-3	9031	44A417033-001	Power Transistor	X	X	X	X	X	X
6-4-4	9033	44A417313-001	Insulating Washer	X	X	X	X	X	X

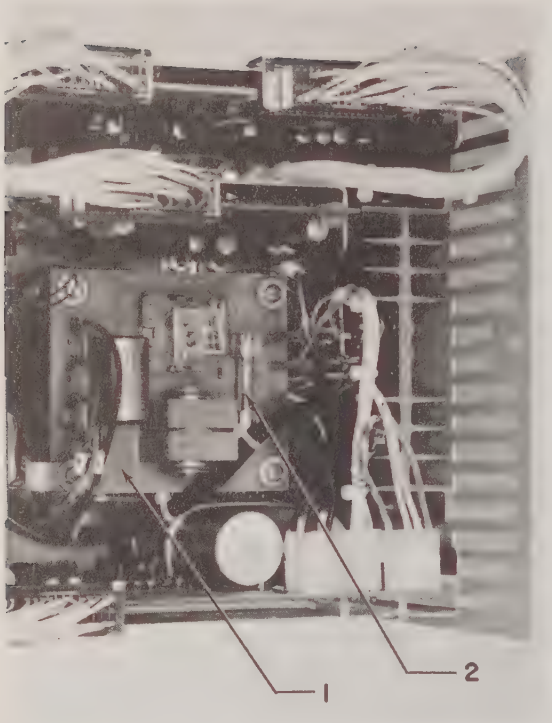
Continued

FIG.	CODE	PART NUMBER	DESCRIPTION				Export		
				A1	A2/ A4	A3	A1	A2/ A3	A4
6-5-1	9005	44A417381-001	Tape Deck Assembly, Round Shaft	X			X		
6-5-1	9001	44A417381-002	Tape Transport, Round Shaft		X	X		X	X
6-5-1	9002	44A417381-003	Tape Transport, "D" Shaft		X	X		X	X
6-5-2	9071	44A417381-101	Photocell	X	X	X	X	X	X
6-5-3	9074	44A417381-107	Rewind Spindle	X	X	X	X	X	X
6-5-3	9079	44A417381-115	Rewind Spindle ("D" Shaft)		X	X		X	X
6-6-1	9065	44D430300-G01	Chassis Assembly	X	X	X	X	X	X
6-6-2	9066	44C430203-001	Support	X	X	X	X	X	X
6-6-3	9067	44C430206-G01	Support	X	X	X	X	X	X
6-6-4	9068	44A417360-002	Printed Circuit Board Guide	X	X	X	X	X	X
6-6-5	9069	44B430106-G01	Wire Harness with AC Receptacle	X	X	X	X	X	X
6-6-6	9070	44C430203-002	Support	X	X	X	X	X	X
6-7	9000	44C430200-G01	TCA Enclosure	X	X	X	X	X	X
6-8	1215	44A333474-003	Rubber Foot	X	X	X	X	X	X
6-9	9017	44D430304-G01	Interconnection Cable Assembly	X			X		
6-9	9018	44D430304-G02	Interconnection Cable Assembly	X	X	X	X	X	X
6-9	9048	44D430304-G04	Interconnection Cable Assembly	X			X		
6-9	9049	44D430304-G05	Interconnection Cable Assembly	X	X	X	X	X	X
6-10	0012	44A417020-001	Power Cord and Plug	X	X	X			
6-10	9056	44B412589-G01	Power Cord and Plug				X	X	X
6-11	6044	44B417402-G01	TRP/1 Printed Circuit Board	X			X		
6-11	6045	44B417402-G02	TRP/2 Printed Circuit Board		X			X	
6-11	6043	44B417402-G03	TRP/3 Printed Circuit Board			X			X
6-12	9007	44A417224-001	TapeCassette	X	X	X	X	X	X
6-13-1	9077	44A417381-105	Rewind Motor (A1)	X			X		
6-13-1	9076	44A417381-104	Rewind Motor (A2/A3)		X	X		X	X
6-13-2	9078	44A417381-106	Forward Motor (All)	X	X	X	X	X	X
6-13-3	9072	44A417381-102	Rubber Tire	X	X	X	X	X	X
6-14-1	9073	44A417381-103	Solenoid	X	X	X	X	X	X



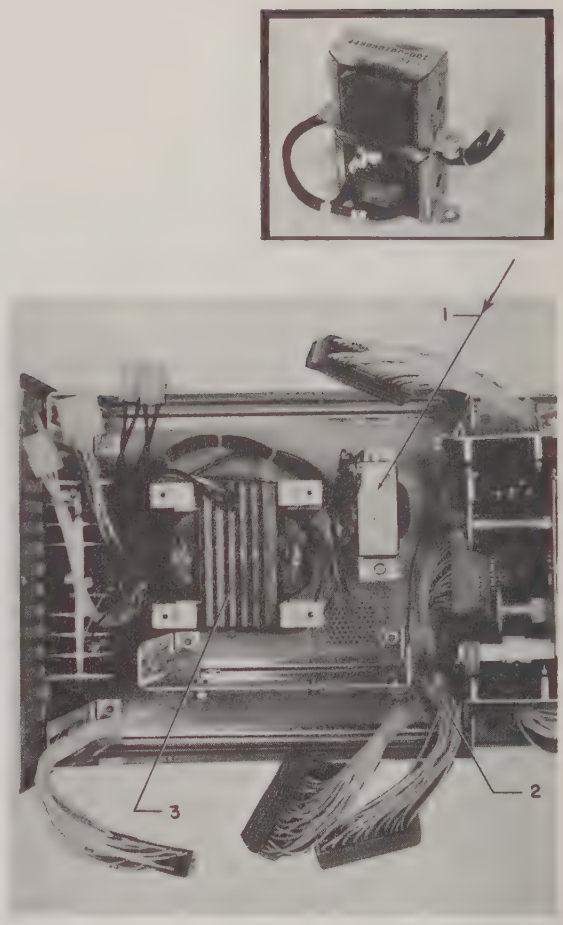
TCA-4039

Figure 6-1. Printed Circuit Boards and Connectors and Brackets



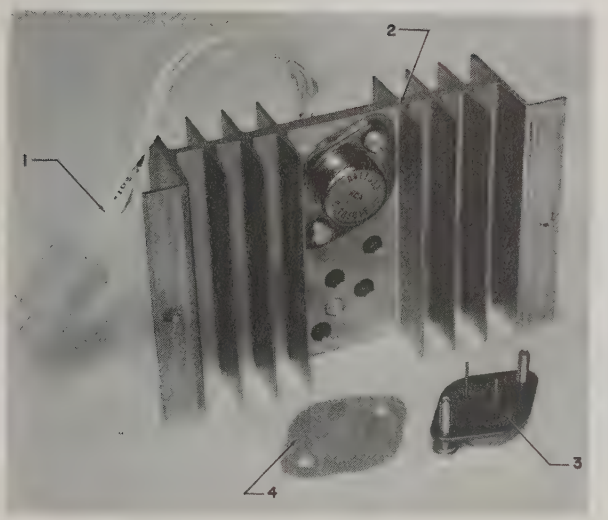
TCA-4040

Figure 6-2. TLP Printed Circuit Board and Fuses



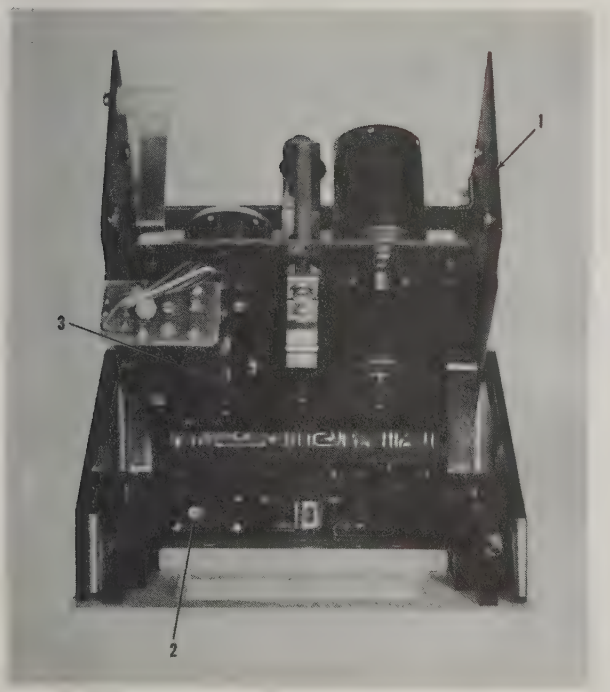
TCA-4041

Figure 6-3. Power Transformer, Reactor, and Main Frame Harness



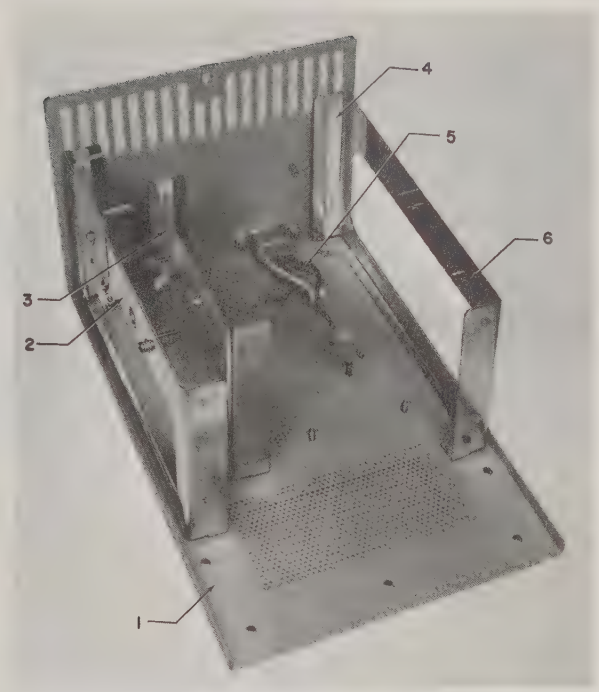
TCA-4042

Figure 6-4. Heat Sink and Transistors



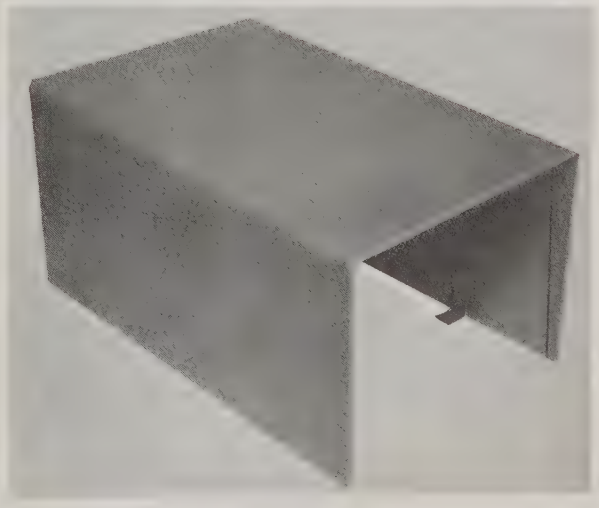
TCA-4017

Figure 6-5. Tape Deck Assembly



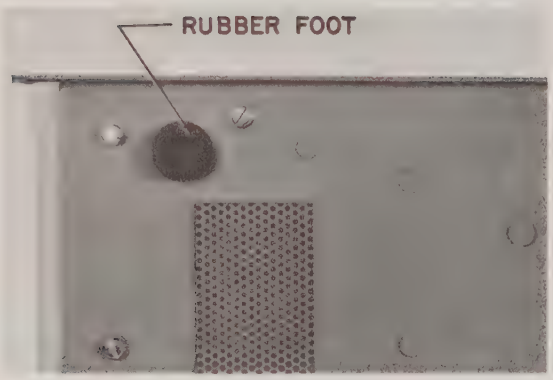
TCA-4043

Figure 6-6. Chassis, Supports and Wire Harness



TCA-4044

Figure 6-7. TCA Enclosure



TCA-4045

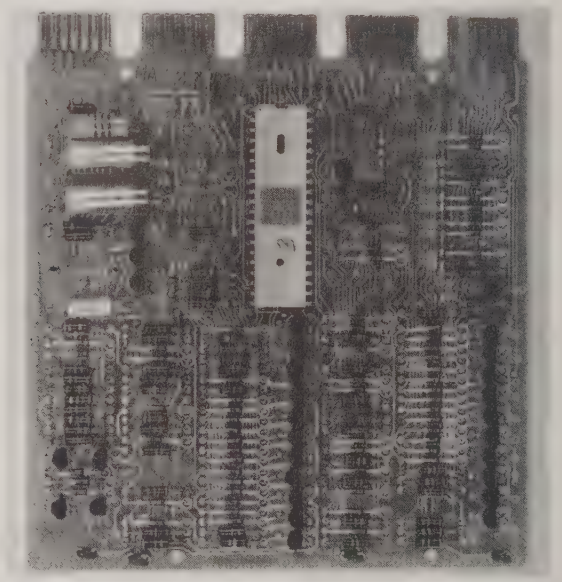
Figure 6-8. Rubber Foot

TCA-4047

Figure 6-10. Power Cord and Plug

TCA-4046

Figure 6-9. Interconnection Cable Assembly

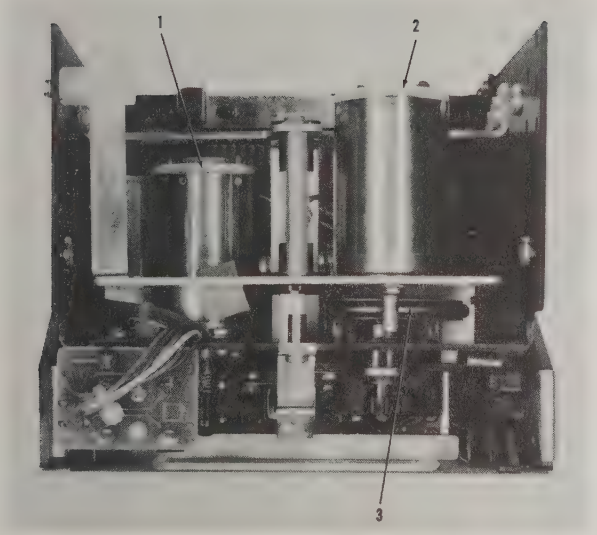


TCA-4048

Figure 6-11. TRP Printed Circuit Board

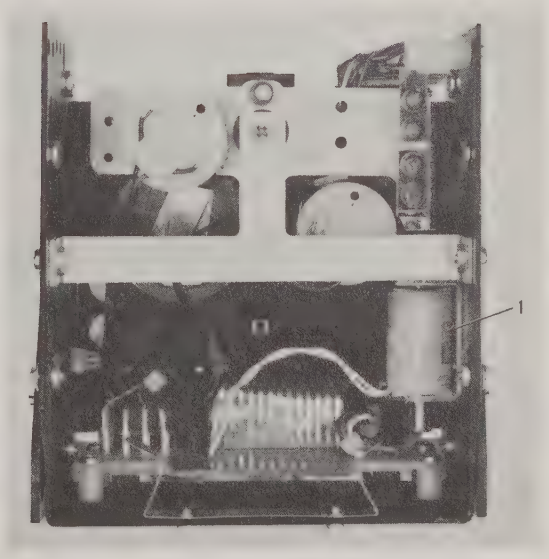
TCA-4049

Figure 6-12. Tape Cassette



TCA-4019

Figure 6-13. Motors and Rubber Drive Wheel



TCA-4018

Figure 6-14. Forward Motor Solenoid

DOCUMENT REVIEW SHEET

TITLE: TermiNet Cassette Accessory (TCA) Service Manual

PUB. #: GEK-35981A

From:

Name: _____

Position: _____

Address: _____

_____

PLEASE CUT ALONG THIS LINE

Comments concerning this publication are solicited for use in improving future editions. Please provide any recommended additions, deletions, corrections, or other information you deem necessary for improving this manual. The following space is provided for your comments.

COMMENTS: _____

_____

_____

_____

_____

_____

_____

_____

NO POSTAGE NECESSARY IF MAILED IN U.S.A.

Fold on two lines shown on reverse side, staple, and mail.

Staple Staple

FOLD

FIRST CLASS
PERMIT
NO. 124
Waynesboro, Va.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

CUSTOMER SERVICE
General Electric Company
Data Communication Products Dept.
Waynesboro, Virginia 22980

FOLD

Data Communication Products Department • General Electric Company
Waynesboro, Virginia 22980, USA

GENERAL ELECTRIC

MP MASTER
MA32649